BROOKLYN BOTANIC GARDEN

PLANTS & GARDENS

ROSES

Planting, Pruning, Year-Round Care
Contemporary and Old Roses
Landscape Planning and Uses
Arranging and Exhibiting
Hybridizing and Propagating

BROOKLYN BOTANIC GARDEN RECORD / PLANTS & GARDENS
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BROOKLYN BOTANIC GARDEN RECORD
PLANTS & GARDENS

ROSES

Vol. 36 Spring (May) 1980 No. 1

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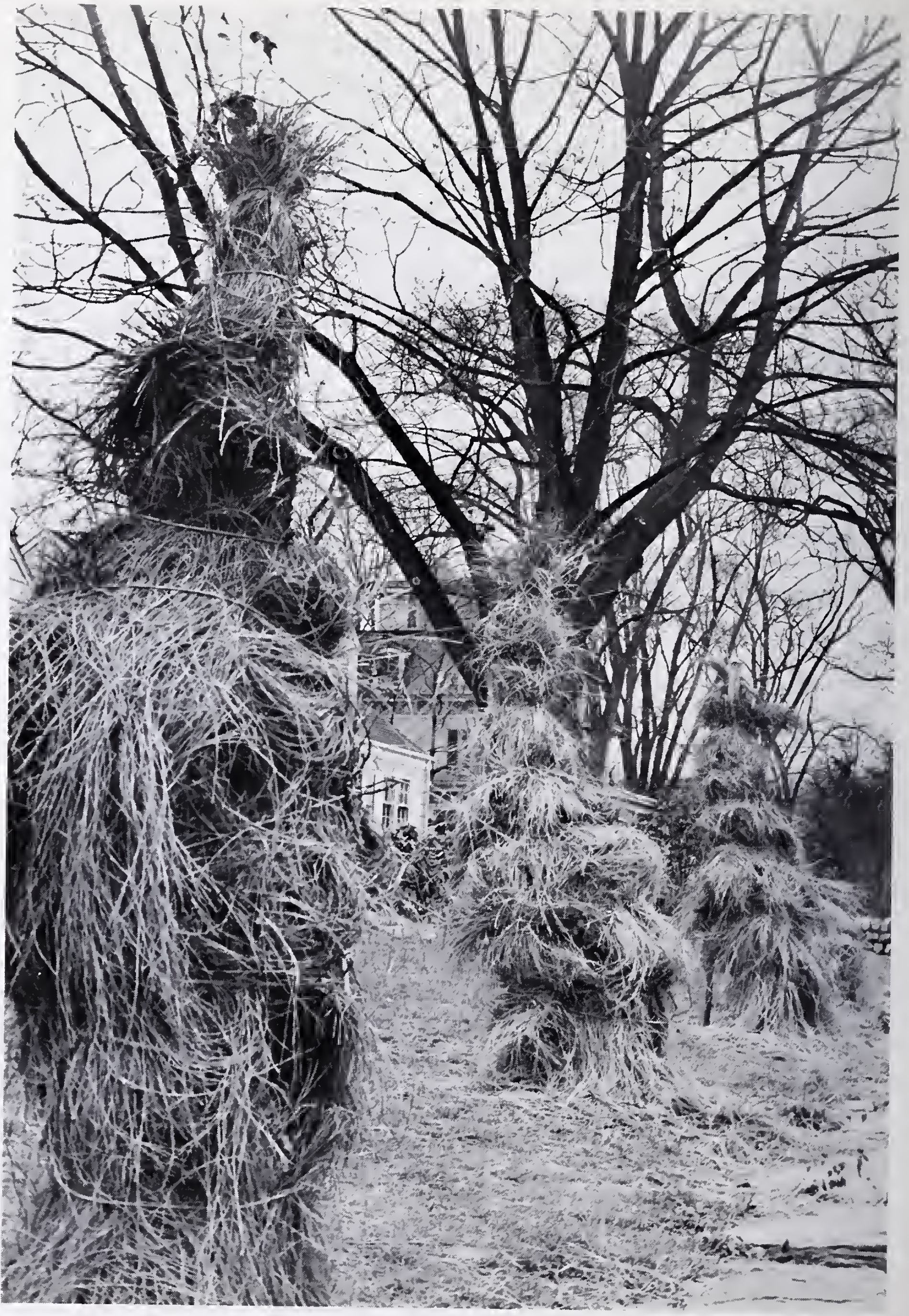

Herman Gantner

In the coldest areas of North America protection such as these fanciful "straw men" helps climbing roses survive the winter.

Letter from the Brooklyn Botanic Garden

"Rose is a rose is a rose is a rose," saieth Gertrude Stein. Guest Editor David Stump and his twenty-five expert Contributors retorteth, "Not so fast! There's more to it than that." Indeed, there are more than two hundred species, only a few of which are grown in gardens, plus thousands of hybrid teas, floribundas, climbers and miniatures. They have been crossed and backcrossed, selected and reselected, so that the large-flowered, more-or-less everblooming sorts we see today have come a long way from their wildwood roots. There is hardly a garden in America that doesn't have a rose.

With apologies to Ms. Stein, it's time for Brooklyn Botanic Garden to take another look at roses. Sixteen years have passed since the last full-dress inspection, and BBG is fortunate now to have Mr. Stump bring us up-to-date. As President of Jackson & Perkins, one of the world's leading rose firms, Mr. Stump is eminently qualified to do so. The Botanic Garden is indebted to him and the many fine people he has enlisted to contribute articles.

Roses are the favorite flower of millions of people. Their form, their grace, their fragrance set roses apart from all other kinds of bloom. They have been grown in gardens since ancient times, and their role in history and literature exceeds that of any other ornamental plant. Roses are a symbol of love, and most of us can recall some childhood memory of them. If there were a compelling need for a national flower (which we don't think there is), the rose would be high on the list of applicants. However, it transcends man-made boundaries and is international in appeal. Call it the world flower!

The Cranford Rose Garden at BBG, now more than fifty years old, is a good place to study these wonderful plants. In terms of varieties grown, this is America's third largest rose garden, and probably the most popular of the many gardens within a garden at BBG. Why not visit it this year?

And take time out to smell the roses!

Sincerely,

Frederick McGourty, Jr.

Editor

Roche

'Silver Moon'

A HAPPY MARRIAGE

D. S. Stump

Most of my working life, over thirty-five years, has been spent in the nursery industry with two firms, both specializing in the hybridizing and marketing of roses. It has been a rewarding and satisfying experience.

Growing roses is the kind of business where friendships are formed that are different and closer than those experienced in most industries. From among those many friends were selected the authors whose writings have made this revised Handbook possible. I thank them all.

To say that very early I fell in love with roses is not an overstatement. My formal training was in the area of advertising and graphic arts, and my entry into the nursery industry opened a whole new world . . . the fascinating world of plants—plant production and marketing, plant breeding and evaluation, plant identification and nomenclature. There was much to learn and each bit of knowledge gained led to even more to be learned. This wonderful life of learning continues even now.

But it was the ROSE, the most universally used and loved ornamental plant, that captured me completely. Although I was associated with plant breeding of various ornamentals and fruit trees, working with roses became my prime engagement—and one could not have asked for or enjoyed more this happy and fruitful "marriage."

One of my first jobs was to count rose plants in the nursery and make an estimate of the crop grade for the coming season. It was necessary to quickly learn variety identification. Color and form of the flower are not always reliable because of the variability that occurs, depending on the growing locality. Herb Swim taught me to learn the distinction of foliage, arrangement of thorns, and other characteristics of the plant which are more uniform indicators so one would not rely solely on color and form for identification.

It was also with Herb Swim, along with Awdry Armstrong, that I was initiated into the marvelous world of evaluating new rose seedlings. Words are not adequate to express the feeling that comes when one sees a new rose for the first time. In those days, all new seedlings were transplanted from the germination flat to small clay pots and then transplanted to the nursery row, so that when first seen in bloom, we were looking at the original seedling.

I have no record of how many thousands of seedlings I've looked at or how many notes I have written over the years —it would be in the hundreds of thousands. But out of all those roses, I'd guess that not over several hundred have ever been marketed or seen by those of you who will read and use this Handbook.

There is nothing quite as exciting, at least to me, as seeing for the very first time an outstanding bloom on a new seedling. It is a stimulating mental experience. A multitude of questions immediately crosses the mind. Is it distinctive? Is it a new or different color? Is the plant vigorous? Is it reasonably disease-free? And on and on. Oh, and is it fragrant?

In walking the seedling fields, a grower finds that his eye is always attracted by color. I have a habit of snapping a bloom off when I'm attracted by its color and I may glance at its form as the bloom is on the way to my nose to test for fragrance. I remember walking a seedling field one day with several notable rose breeders, among whom was Fred Howard. Fred was walking down the rows of seedlings, snapping off blooms, smelling them and throwing them on the ground, and finally saying, "You young rose breeders don't know how to breed for fragrance."

There are many who believe that there are not as many fragrant roses being introduced today as in the past, but my research does not support that. While breeding for fragrance is a most elusive task, there are just as many fragrant roses introduced now as there were fifty years ago.

In looking back over the years, it is easy to see the improvements that rose breeders have made to the rose. There have been new colors combined with better form, flowers that have better substance, are less influenced by the vagaries of weather, and are longer lasting on the plant or when cut.

The greatest improvement has been in plant vigor and, consequently, greater flower production. Varieties that we were growing when I first counted them in the field would not get a second look in our seedling fields today. Varieties that were deficient in vigor have simply passed out of commerce.

As I write this, it is autumn and in a few weeks we will be looking at our seedlings for the last time this year. We will be reviewing final selection of a limited number of seedlings and making decisions on their introduction four or five years hence. The notes will be reviewed (many of them may go back four or five years) and after much discussion the die will be cast—to go ahead or discard.

But the next spring the process starts anew. We will be seeing a new rose for the first time in the nursery row, and perhaps we'll see the first perfect rose. Doubtful, yes, but then, "Man's reach must be greater than his grasp or what's a heaven for?"

Helping to put this Handbook together has been interesting and enjoyable. The authors might have many differing opinions, but all have one thing in common—love of the rose. I hope you find the articles they have contributed to be interesting and useful. Further, it is the hope of all of us that your use of this Handbook will encourage you to plant and grow roses, and that you'll share our love of this most useful and beautiful of all ornamental plants.

The new grower should know . . .

HOW ROSES ARE CLASSIFIED

R. J. Hutton

The botanical group of plants we call roses is exceedingly large and complicated. There have been one hundred fifty recognized and described species of roses found throughout the northern hemisphere from *Rosa blanda* of northern Canada to *Rosa clinophylla* of the tropics. Over twelve thousand kinds of roses are listed in *Modern Roses 7* published in 1969.* A form of classification of the many rose types is necessary to group them accordingly to similar characteristics. Unfortunately, there is not full agreement as to what these groups should be and how they should be defined. The problem of classification of roses is due to their diversity, popularity, wide distribution and complex crossbreeding.

Those who have an interest in classifying roses include: the scientific community for whom botanical classification is an all-important tool; the hobbyist who grows roses for exhibition in competitive rose shows, to whom competitive classes must be clearly defined; and the gardening public who buy most of the roses grown, sold and enjoyed in the United States and throughout the world. It is for the gardening public that this is written as guidance and clarification.

A system of classification is possible by observing growth characteristics and by cataloging the uses which take best advantage of these growth characteristics. However, when a group of plants is so highly crossbred as roses, it is only natural that lines are crossed and gradations are no longer clear cut. This leads to occasional arbitrary decisions. Also, it is not unusual for a variety to display a different habit of growth in the cool New England air than it does in the hot, dry Southwest. What may be a well-defined grandiflora in a hybridizer's California test fields might grow more like a hybrid tea along the Gulf Coast and a floribunda along the Canadian border.

The uses we make of roses is determined primarily by the growth habit of the plants and their flowering characteristics, as well as some differences such as winter hardiness which are outwardly less visible. This brings us to our first broad functional classification:

Indoor roses: A small but increasingly important group made up of those especially bred for the fresh-flower market and as flowering pot plants. Their physical characteristics overlap with the outdoor roses, but their genetic makeup is such that they grow and flower under the controlled environment of greenhouses and adapt to brightly lit homes or offices.

Outdoor roses: Here we have the great majority of types and sizes of both plant and flower. Outdoor roses include all the garden types and natural species and comprise 99.9 percent of the different roses known and grown.

Next we can establish broad classifications of outdoor roses. Let's look at three groups separated by general growth characteristics:

Bush roses: Self-supporting, upright growing plants bearing flowers primarily on the top of the plant; plant height ranges from a few inches to five or six feet under average growing conditions in most of the United States.

Climbing roses: Those of exceptional vigor, producing long canes which require support. These may range from five feet to twenty feet or more depending on the kind and how they are supported and maintained.

Shrub and ground cover roses: Shrubs are broad, upright plants whose canes are self-supporting but tend to arch in graceful forms. Ground cover roses are pros-

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**Modern Roses VIII* to be published in 1980.

A.B. Morse Co.

'Peace', one of the world's best-known and best-liked decorative hybrid tea roses, is a vigorous, floriferous rose.

trate plants or those which have a slightly arched growth then trail along the ground. Both usually have flowers borne in trusses at the ends of the canes and from branches along the canes.

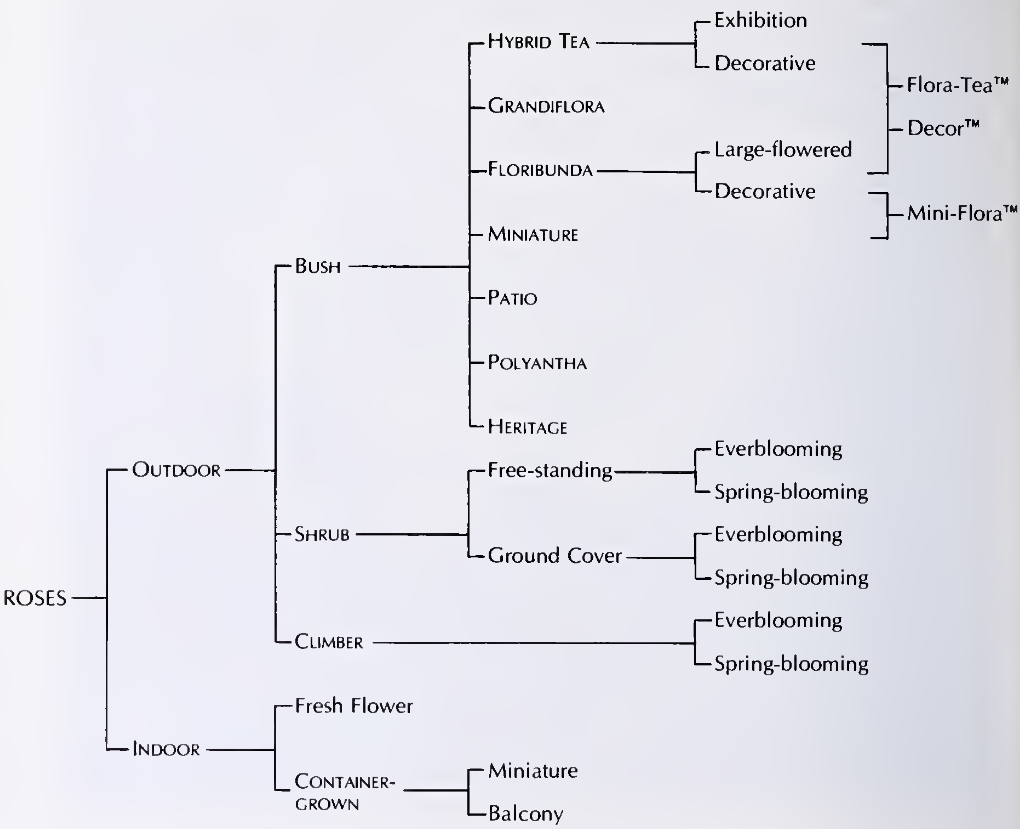
Bush Roses

Of the three groups the most commonly used and by far the best known are the bush roses. They break down into four important categories: hybrid tea, grandiflora, floribunda and miniature. In addition, and of less importance, are polyantha, patio roses, heritage (old) roses and commercial trademarks such as Flora-Tea, Mini-Flora and Decor roses.

Hybrid teas: Here we have the aristocrats of rosedom, the most popular type of roses in America today. They feature attractive buds and relatively large flowers, well-formed and symmetrical. The plants are vigorous enough to provide more-or-less continuous bloom. In general they grow from 2½ to five feet tall and produce stems long enough and strong enough for cutting. Emphasis is on individual flowers for close-up enjoyment in the yard, as fresh flowers for indoor decoration, competitive shows and general garden decoration. The flowers are nearly always double with twenty to fifty and more petals. They come in all shades except a true blue. Most are fragrant, some with a rich perfume that can fill a room.

It is becoming increasingly desirable to separate hybrid teas into exhibition kinds and decorative kinds. *The exhibition hybrid tea* is the mental image most of us conjure up when we hear or see the word

Roses classed by growth characteristics and most common usage



"rose." It is the classic, long, pointed bud nearly always one to the stem, and these stems are especially fine for cutting. This group may not produce as many flowers in a season but each one is a dream. *Among the most popular:* 'First Prize', pink; 'Royal Highness', pink; 'Double Delight', red blend; 'Garden Party', white.

The decorative hybrid teas have flowers of quality virtually equal to the exhibition kinds and produce far more blooms and give a more colorful display. Stems are fine for cutting, but there may be occasional clusters of two or three flowers to a stem. Unless you are an exhibitor or a perfectionist, the decorative hybrid teas will be more satisfying. *Among the most popular:* 'Peace', yellow; 'Tropicana', orange; 'Mister Lincoln', red; Friendship™ (variety: 'Linrick'), pink; 'Paradise', mauve; 'Double Delight', red blend (the all-purpose Hybrid Tea); 'Oregold', yellow; 'Honor', white.

Grandifloras: Vigorous plants of relatively tall growth and an abundance of flowers. They provide masses of color for garden decoration and have individual stems long enough for cutting. Here we have a combination of lots of color with well-formed buds and flowers of hybrid tea quality. In general, grandifloras are well suited for background plants and colorful displays while still providing stylish bloom on fine cutting stems. *Among the favorites:* 'Queen Elizabeth', pink; 'Sundowner', copper; 'Love', red and cream bicolor; 'Prominent', orange; 'Arizona', bronze; 'John S. Armstrong', red.

'Oregold' hybrid tea, 1975 AARS Award winner.

'Love', 1980 AARS Award-winning grandiflora.

Photos: All-American Rose Selections

'First Edition' floribunda, 1977 AARS Award winner.

'Rose Parade', 1975 AARS Award-winning floribunda.

Photos: All-American Rose Selections

Floribundas: Worldwide the most popular class of rose because of their profuse blooming and little need for care. They come in the full range of rose colors in a wide range of flower sizes. Ideally, floribundas should be planted in groups of three or more and are most effective massed fifty or more to a bed. They have a place in almost any landscape or garden planting for all-season color and added interest. Floribundas divide themselves into two groups.

Decorative floribundas have masses of bloom in clusters which come in waves through the season. Flowers range from five petal singles to fully double mostly two to three inches across. The plants grow from 18″ to 3½′, compact, lots of foliage, free flowering and especially hardy. *Among the favorites:* 'Charisma', multicolor; 'Europeana', red; 'Rose Parade', pink; 'Bahia', orange.

Large-flowered floribundas are fully as colorful as the decorative hybrid teas but also have large flowers, often one to the stem, fully double, of good form and all the newest colors. Plants are compact, floriferous and neatly formed. A development of recent years, they add a new dimension and excitement to garden plantings. *Among the favorites:* 'Cherish', pink; 'Apricot Nectar', apricot; 'Saratoga', white; 'Angel Face', mauve.

Miniatures: Originally these were diminutive forms of hybrid teas and floribundas with plants seldom exceeding twelve inches and blooms the size of a quarter. Today many approach floribundas in plant and flower size. They are compact, well-branched, with dense growth and leaves and flowers complementing the scale of the plant. Floriferous and often more hardy than their larger counterparts, miniature roses are becoming increasingly popular as garden, landscape and indoor plants. *Among the favorites:* 'Chipper', coral pink; 'Gold Coin', yellow; 'Starina', orange-red; 'Red Cascade', dark red; 'Cinderella', white; 'Bo-Peep', pink; 'Holy Toledo', copper.

Patio roses: Coming into increasing use are these plants with relatively large, colorful flowers on a moderate size plant, vigorous and continuously flowering. Well suited for compact gardens and container growing for balconies, porches and patios.

Miniature rose 'Bo-Peep', massed as an edging for a walk.

Roche

Tree roses (Standards) are not a class of roses but a form of bush-rose bud grafted on a long-stemmed understock to form a trunk. Regular tree roses are hybrid teas, grandiflora or floribundas on trunks 30″ to 36″ high. Patio trees are small-flowered floribundas or patio roses on trunks 18″ to 24″ high. Miniature trees are miniature roses on trunks 10″ to 15″ high.

Tree roses make beautiful garden accents and give an added dimension to plantings. In colder areas they require special winter protection. (Tree roses are not shown on the accompanying classification diagram since they do not form a class of roses.)

Polyanthas and hybrid polyanthas: This group falls between the old heritage roses and the modern floribundas. Very free flowering, in clusters, they were especially popular in the first third of this century. Low growing and especially hardy but with somewhat small flowers. The "Koster" types, 'Cecile Brunner' (Sweetheart rose) and 'China Doll' are still in commerce.

Flora-Tea, Mini-Flora and Decor: These are commercial trademarks developed to describe types of roses for merchandising purposes. They are descriptive and appropriate to the kinds of roses to which they are applied.

Heritage roses: Those that were grouped as "Old" roses, and which were developed in the nineteenth century fall in this class. For the most part they came directly from species roses and include Alba, Bourbon, Centifolia, Damask, Gallica, Moss, Noisettes and Rugosa types. (More on these in the article titled "Roses of Yesterday.")

Climbing Roses

Climbers: Vigorous roses producing long, supple canes which lend themselves to training on supports such as fences, arbors, buildings and nearly any type of structure. Since roses do not entwine or have tendrils or any means of attaching themselves, they must be fastened to their support.

Everblooming climbers of today present a curtain of color in their spring bloom followed by additional bloom almost continuously through the season. Many are of hybrid tea quality and size, with good cutting stems.

Roche

Climber 'New Dawn'.

Spring-blooming climbers bloom only in spring and are often the hardiest type of rose. They make up in vigor what they lack in continuous bloom.

Climbing forms of bush roses are known as sports (mutations). They produce flowers of exactly the same type as the bush forms from which they come. Often these climbers are less hardy and are not recommended for colder areas of the United States.

The use of climbers is limited only by one's imagination. They are ideal as screens which can be inpenetrable to man or animal and provide color through most of the growing season. They can be trained vertically, horizontally or up and over a pergola or archway. Climbers soften harsh architectural features and decorate fences most effectively. They are ideal to define areas, whether a small garden in the corner of a yard or the limits of an athletic field. *Among the most popular:* 'Blaze', red; 'Golden Showers', yellow; 'America', coral; 'Red Fountain', red; 'New Dawn', pink.

Shrub and Ground Cover Roses

Shrub: A catch-all class of roses which do

'America', a coral everblooming climber.

All-America Rose Selections

not clearly belong in any other group. They are less formal plants coming in a wide range of sizes and forms. They include both upright, free-standing bushes and those which are prostrate and trail along as ground covers.

Free-standing shrubs: These grow broadly upright with canes that tend to arch outward forming a plant which is broader than it is high. Flowers come at the ends of the canes and on branches along the canes. *Spring-blooming shrubs* are those which flower only in spring. *Everblooming shrubs* grow vigorously, but not necessarily large, to flower almost continuously through the season.

Both types frequently set yellow, orange or red fruit which add color during the fall and winter. The fruit often attracts birds and small game for the seed in the fruit. The fall and winter color of the fruit makes shrub roses especially attractive for yard, garden and commercial landscapes. Large kinds can be used for specimen or mass plantings and compact types for hedging, fences and bank covers. *Among the favorites:* Carefree Beauty™ (variety: 'Bucbi'), pink; 'Gartendirector Otto Linne', pink; 'Golden Wings', yellow.

Ground covers: Usually vigorous roses which grow outward and only slightly upward. They are broad, almost prostrate or slightly mounded. Like free-standing shrubs they may be *Spring-blooming* or *Everblooming*. There is increasing interest in these as more everblooming kinds are introduced. *Among the favorites:* 'Sea Foam', white; 'New Dawn', pink; 'Max Graf', pink. ❧

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TAKING CARE OF ROSES

Ann Reilly

Take care of your roses and they will reward you with beauty and fragrance all summer long. What about watering? Roses will survive with rather little, but with the right amount you will have healthier plants and blooms that have more substance, better color and longer keeping qualities. If drainage is good, slight overwatering is preferable to underwatering.

Watering and Fertilizing

There is more than one way to water roses. Large gardens and those in areas where rainfall is light will benefit from automatic sprinkler systems. Soaker hoses may be laid on the ground and connected to the garden hose. Because the skill of an acrobat is required to move soaker hoses, especially around large plants, it is best to purchase enough to cover the entire garden and leave them in place all summer. In small gardens, the hose may be laid on the ground and the water allowed to run from it, or you can water by hand. Although effective, these last two methods are time consuming.

One of the easiest ways to water is with an overhead sprinkler. This should be run only in the morning, however, because wet leaves at night encourage disease. A few beneficial side effects of overhead watering are that spray residue and dust are washed from the foliage, and the high moisture discourages spider mites.

Roses should be watered regularly through the growing season if the skies do not cooperate with rain. The equivalent of one inch of rain should fall on the rose garden each week. People gardening in mild climates must water more often than in cool ones. Sandy soils which drain quickly need to be watered more often, while heavy clay soils require less frequent applications.

Frequency of watering also depends on the weather. When the temperature rises to 90°F, turn the water nozzle on more often. If you are not sure when your roses need water, stick your finger into the ground as far as you can. If it hits dry soil, it is time to water.

Next to watering, fertilizing is the best thing you can do for roses. A balanced fertilizer such as 5-10-5 (5% nitrogen, 10% phosphorus, 5% potash) or a prepared rose food is ideal. Do not use a fertilizer that is high in nitrogen, such as the type for lawns, or you will have fewer flowers.

Roses should be fed at least three times a year—right after spring pruning, after the first flush of bloom, and about two months before the first autumn frost is expected. In very mild or frost-free areas, a last feeding can be made about two months before you encourage plants into dormancy.

Follow label directions for the proper amount of fertilizer to use, then apply over the entire root area, but not on the bud union. Very lightly work the fertilizer into the soil or the mulch, and water in well. Large shrubs and climbers can be given a little more fertilizer than bush roses, and miniatures should be given less.

Slow-release fertilizers make nutrients available when the weather is warm and shut off the supply when it gets cold. They may be used in place of the second and subsequent feedings and therefore save a lot of work. Applying a water-soluble fertilizer is another way to get nutrients to roses. Although it is not a good substitute for dry feeding because it has to be done every week or two, it is a great way to give plants an added boost.

Mulching and Spraying

Roses can grow without being mulched but perform better and are more attractively displayed if they are. A two- or

Herman Gantner

A low-nitrogen fertilizer, applied three times a year, should be worked in lightly followed by a good watering. Sprays give good coverage for disease or insect control.

Roche

Roche

Many materials are suitable for mulching, including the buckwheat hulls above. Mulches conserve moisture, cut down on weeds and improve soil structure.

three-inch layer of mulch keeps the soil cool, conserves moisture and cuts down on weeding, provided the area has been thoroughly weeded before an application. As it decomposes, mulch improves the structure of the soil and eventually adds some enrichment. Left in place all winter, it helps prevent heaving caused by alternate freezing and thawing.

What is a good mulching material? Look for one that is light, permeable and attractive, such as wood chips, pine needles, buckwheat hulls, cocoa-bean shells, sawdust or chopped leaves. Peat moss is a poor choice, as are grass clippings unless they are put down thinly or pre-dried. Black plastic is being used increasingly for mulch, and is extremely effective in controlling weeds. Be sure to cut a large enough hole in the plastic around each plant so water can get through. If the plastic doesn't appeal to your aesthetic sense, hide it with wood chips, leaves or something similar.

Mulching doesn't completely prevent weeds, so keep your eyes open for unwanted greenery that will need to be pulled. If you don't mulch, be especially on the lookout for weeds that may be robbing your roses of nutrients, water and light or inviting disease by cutting down air circulation.

Insects and diseases like roses as much as we do. We are, however, fortunate to have a good supply of effective chemicals and easy-to-use spray equipment to make the control of rose pests relatively simple.

Spray or dust? Dusting has the advantage of not needing to be mixed and the disadvantage of not giving as effective coverage as spraying.

Spray to control insects if there is a problem. Diseases, on the other hand, need to be prevented by regular spraying every ten to fourteen days through the growing season. Insecticides and fungicides can generally be combined in the same spray if you need both. In any case, read the labels carefully and always handle chemicals with respect.

The major insects that attack roses are aphids, Japanese beetles, midge and thrips. A number of products are available to control these, but the general recommendations are malathion for aphids, Sevin for Japanese beetles, a Diazinon soil drench for midge and Orthene for thrips. Spider mites are not really insects, but their damage is the same and is at its worst in hot, dry situations. They can be controlled with Kelthane and discouraged with water.

The three major disease problems of roses are mildew, blackspot and rust. Benlate, Actidione and Triforine stop mildew; Phaltan, Captan, Ferbam and Triforine halt blackspot in its tracks; rust, found mostly in cold areas, can be controlled with Ferbam.

Roses are harder to care for and take more time than marigolds. But they are worth it.

What you need to know about . . .

PLANTING ROSES

R. C. Allen

Whoever first gave the impression that roses are difficult to grow did the gardening community an injustice because there are few plants that will give as much pleasure for the effort expended. Because the rose is the embodiment of refinement and perfection among flowers, it is only natural that gardeners try hard to grow bushes and blooms that live up to the ideals pictured in catalogs or seen in rose shows. But even an imperfect rose will bring beauty and joy to the beholder.

Location and Soil Preparation

Unless the spot selected for planting roses has a minimum of six hours of full, or nearly full, sunlight a day, it will not be a desirable one. In general the more sunlight, the better growth and flowering. If one has a choice, it is better to have sun in the morning so that the opening blooms are not subjected to the bright sun during the hottest part of the day.

Soil drainage is another factor. Roses will not thrive in wet, soggy, poorly-drained soil, and it is futile to plant them in such a location. The best solution is to place the beds where drainage is naturally satisfactory. In severe situations drain tile should be installed, or raise the level of the beds eight or ten inches above ground level.

Nearness to large shrubs or trees should be avoided. Because of the fertilizing, watering, and other cultural practices, their roots may invade the rose beds and compete for nutrients and moisture. Fortunately roses are tolerant of invading roots if sufficient fertilizer and water are supplied. Planting closer than two feet from walls should also be avoided.

Air circulation is more important in the location of a large garden than where just a few beds are involved. Rarely do roses thrive in a sunken-type garden where the air does not move freely around the plants. In windy locations, too much air movement at certain times may make some type of windbreak protection desirable. Roses are more likely to do best where the air flows away from the beds rather than settling around them making the area subject to late spring or early fall frosts.

Any moderately fertile soil will grow good roses with little special preparation. Most garden soils, however, can be improved by incorporating fairly large quantities of peat moss, compost, leaf mold or well-rotted stable manure. Such organic materials should be spaded deeply and thoroughly into the soil. Working in superphosphate at the rate of three pounds/100 sq. ft. of ground area is also desirable in most localities. Preparing the soil well ahead of planting is advantageous.

Having the soil tested for alkalinity or acidity is a good precaution although roses are tolerant of a wide range of pH values. If the soil is very acid (pH 5 or lower) ground limestone should be mixed thoroughly into the soil at the rate of three to ten pounds/100 sq. ft. depending upon the degree of acidity. If the soil is distinctly alkaline (pH 7.5 or higher) an application of powdered sulphur at the rate of three pounds/100 sq. ft. will in time help reduce the alkalinity. The optimum pH value for roses is about 6.5.

Purchasing and Planting Time

Since more than a thousand different kinds of roses (varieties or cultivars) are offered by mail-order nurseries and garden centers, the choice is nearly unlimited if not bewildering. The American Rose Society offers a *Handbook for Selecting Roses* which gives the national

Preferred Times for Planting

Zone 1	Pacific Northwest	February, March
2	Pacific Seaboard	January, February
3	Southwest	Late December, January
4	South Central	Late January, February
5	Mid-South	February, March
6	Subtropical	December, January
7	North Central	April, Early May
8	Eastern Seaboard	March, Early April
9	Northeast	April, Early May

rating of the cultivars available in the United States. The All-America Rose Selections recommendations are also good to follow. When you visit a rose show or a public garden, jot down the names of those roses that appeal to you. Most local rose organizations issue lists of the cultivars that do best in their localities.

Several different types of rose plants are available. First are the bare-root plants obtained by mail from nurseries that specialize in roses as well as those with general seed and plant catalogues. Many garden centers and large chain stores offer bare-root roses at planting time. Second are packaged plants, which are essentially bare-root except that the roots are wrapped in a moist medium and often the tops are covered with wax to retard drying out.

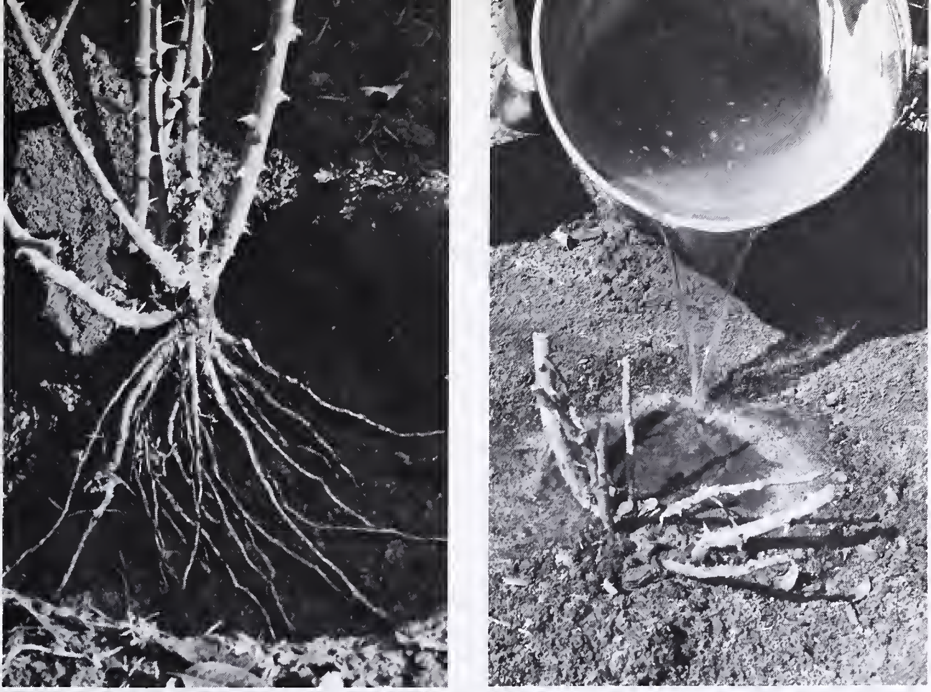
Third are the "preplanted" carton roses, a new type that has been gaining prominence in recent years. These are usually quality plants that have been planted in a good soil mixture in a biodegradable carton so that all the gardener needs to do is dig the hole in prepared soil and set in the carton according to the directions. Still another type is the canned or potted rose. These can be obtained anytime during the growing season from most garden or nursery centers. By and large, mail-order bare-root roses from rose specialists are considered best by most gardeners because they are invariably Number 1 or top grade stock according to the standards of the American Association of Nurserymen.

Bare-root, packaged and preplanted bushes should be set out as soon as the soil can be worked in the winter or early spring, or in general while the plants are dormant and well before much vegetative growth begins. If ordered early, most mail-order nurseries will ship at the proper time for planting. Since these dates vary greatly in different sections of the country the following table keyed to the regional map of the United States may be helpful. The suggested dates are only approximate and may vary within a single state because of differences in altitude and latitude. The principle is to plant as early as possible after the soil can be worked.

Planting and Post-planting Care

The steps in planting are simple, but one should pay attention to details because they often make the difference between a good start and a poor one. When mail-order plants arrive they should be planted immediately. If a delay of two or three days is necessary, the carton should be opened, the plants sprinkled lightly with water, then closed and stored in a cool place. Some gardeners like to place the plants in a tub of water for a few hours before planting, but under no circumstances should they be left in the water for more than eight hours. If for any reason it is necessary to hold the plants for more than a few days, it is best to remove the plants from the box and bury them in the ground to prevent drying out; this should be no longer than two weeks.

The first step in planting is to inspect each bush carefully and cut off any broken branches or roots. Most nurseries now ship with the tops cut back to the proper height for planting, but if the canes are excessively long they should be cut back to ten to twelve inches above the bud union, the knuckle-like swollen area where the top joins the rootstock.



Left, below: Roche. Right: Herman Gantner

Planting bare-root (top left). The crown is at correct soil level and the roots are spread out upon a mound of soil. Top right, water twice, once to settle soil around roots, fill in with more soil, then water again. Below, hilling roses to conserve moisture until roots are established and shoots develop.

Dig the hole large enough to accommodate the roots so that they can be spread out in a natural position. This means a hole fifteen to twenty-four inches in diameter and twelve to fifteen inches deep. The soil used to fill in around the roots should be mixed with about one-fourth peat moss or compost which helps to improve aeration, hold moisture and stimulate new root growth. It helps to make a cone-shaped mound of the mixture in the bottom of the hole, set the plant on it and then adjust the plant to the proper depth.

The depth at which the plant is set depends upon the climate. In localities where the temperature may drop to 0°F or lower, it is well to keep the bud union one or two inches below the general level of the soil. In less severe climates it does not need to be so deep and may be set at ground level, taking into account any settling that may occur.

Once the position is established, spread the roots in a natural position so that the main ones do not overlap. Then start working the peat moss or compost and soil mixture around the roots, preferably with the hands, so that no air spaces are left around the roots. When the hole is about two-thirds full, fill the rest of the space with water so that the soil is brought into close contact with the roots. When the water has drained away, fill in the rest of the soil, firm well and water again thoroughly.

In zones 1, 2, 3, and 6 (see previous page), space hybrid teas and grandifloras 3 to 4 feet apart; zones 4, 5, and 8: 2½ to 3 feet; zone 7: 2 to 2½ feet, and in zone 9: 18 to 24 inches. Floribundas may be planted somewhat closer. Zones 1, 2, 3, and 6: 2½ to 3½ feet; zones 4, 5, and 8: 2 to 3 feet; zone 7: 2 to 2½ feet; zone 9: 18 to 24 inches.

Roses should be protected as soon as they are planted to keep the canes from drying out before shoots begin to develop. The most common method is to mound soil around the plants, practically covering them. As soon as shoots start to grow the soil should be removed gradually.

Another method is to cover the plants with large shopping bags with the top corners cut down about four inches so that the edges can be folded back and covered with soil to hold the bags in place. After a couple of weeks the bags can be slit at the top and the plants inspected. If growth is starting the bags may be removed gradually.

Still another method is to cover the plants with Hot-tents. These are oversized waxed paper hotcaps used by market gardeners that can be placed over the plants. When growth starts, they are opened at the top and eventually removed.

Watering newly-set bushes is necessary unless there is adequate rainfall to keep the ground moist. Moisture stress is reduced which is important in the development of strong vigorous shoots.

While the foregoing suggestions refer primarily to bare-root plants, the same recommendations apply to packaged roses. With these, however, it is desirable to soak the entire plant for several hours in water after removing the packing material.

The preplanted bushes in cartons (which should not be confused with packaged bare-root plants) are the easiest to handle. All that is necessary is to set the carton to the proper level and fill in around it with the peat moss-soil mixture and water thoroughly. Repeated watering is likely to be necessary until the roots have grown out of the decomposing carton.

Canned or potted roses require no special treatment except to make sure that the hole is at least six inches larger and deeper than the size of the container. Place some of the soil mixture in the bottom, remove the plant without disturbing the roots, fill in with soil, and water thoroughly. For about three weeks, watering must be repeated as if the plant were still growing in the container.

Miniature roses, which may be bare-root or potted, should be planted in well-prepared soil and set one to two feet apart.

General Suggestions

A few other suggestions may make future care easier and perhaps improve the quality of the growth. It is convenient if the beds contain but two rows of plants to facilitate the usual cultural practices.

Climbing roses will need support which should be installed before the roses are planted. Climbers are spaced at least six feet apart or even more if they are being grown on trellises or fences.

Tree roses budded on five or six foot understocks are attractive but except in the most favorable climates (zones 1-6) may require more specialized treatment than is easily provided. They may be planted bare-root, but to keep the tops from drying out they must be kept watered, the trunks wrapped with tree-wrap, and the tops covered with moist sphagnum moss in some type of bag, preferably a polyethylene type. Some firms shipping bare-root tree roses supply special bags and moss. Potted tree roses can also be obtained from some garden centers.

As the twig is cut,
so grows the bush . . .

PRUNING ROSES

George Haight

Roses are pruned for several reasons: to produce better flowers; to keep the plant shapely and within bounds; to encourage new basal growth and thus renew the plant. In general, the more severely a plant is pruned, the fewer flowers it will have, but they will be of larger size. Growers who exhibit their blooms at rose shows often follow this practice. A lighter pruning will produce a greater abundance of flowers, making this the more practical method for the average gardener who is interested in having a mass of color in his garden.

Timing and How to Start

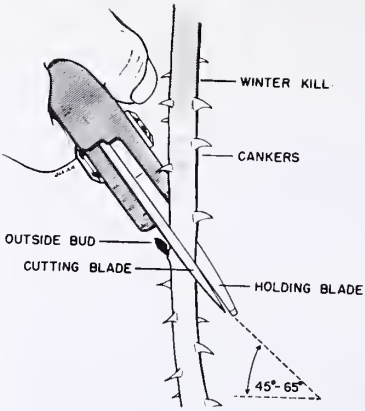
Pruning is best done toward the end of the dormant season, just before the buds begin to swell. In mild climates, pruning may start in late December or January, but in cold parts of the East and Midwest it is best delayed until March or April. In either area it should be completed before the new leaves emerge or the canes will "bleed" sap. If necessary, however, it is better to prune late, despite "bleeding," than not at all. Unpruned plants are a good source for infestation by overwintering insects and disease spores. The earlier you prune, the sooner new growth will force out. In the event of late frosts, more pruning may be necessary on damaged new growth to prevent malformed blooms and blind wood.

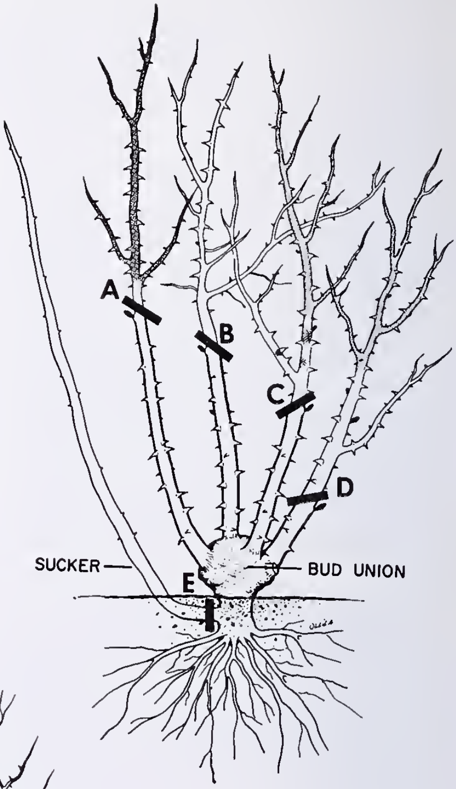
If you are fairly confident of your technique, it is faster to start at the bottom of the plant and work to the top. If you are a bit uncertain as to which canes to remove, start at the top and work down. It will take longer to make decisions about which branches to shorten or remove, but it is a safer approach as you can change your mind many more times.

To begin pruning, remove all dead, diseased or twiggy growth. Growth less than the diameter of a pencil should be eliminated. Older canes that have produced nothing but weak growth should be removed to the bud union (the knob at the base of the plant from which all the canes force out). Then select the canes you wish to retain to form the framework of the plant. Four to eight or more canes may be left depending on the size and age of the plant. An older, vigorous plant can support more canes. The new canes can be distinguished from the older wood by a richer reddish-brown color, smoother wood and brownish thorns. Older canes will be duller in color, have creases and cracks in them, and thorns that as a rule are grayish.

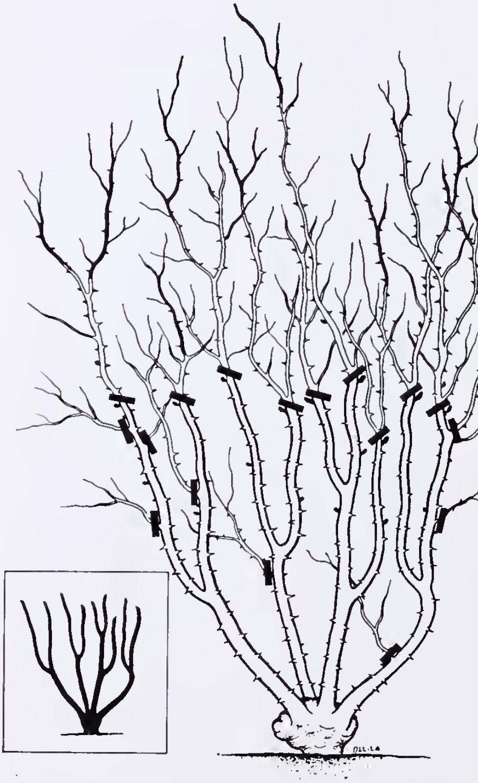
The canes you select to keep may be all new ones if the plant has replenished itself generously during the past season. Generally, however, this is not the case, and you will probably select a combination of old and new canes. Choose carefully so you have a well-balanced, symmetrical plant. Some varieties do not renew themselves by sending out new basal shoots. In this event, retain the best of the older canes. The best flowers are produced on the newer wood, however, so some of the older canes may be removed to the bud union.

Cut close to the bud union and do not leave two-to-three-inch stumps that will be subject to rot and disease. Proceed to shorten the canes that grew during the past summer by one-third to one-half, but do not cut into the heavy old wood, as this may cause dieback. Always leave a lateral or branch on these old canes. Then thin out the smaller branches at the top and open up the centers of the plant for better air circulation, light penetration and greater





Above, proper application of the hand pruner to the rose cane. The cutting blade must be on the lower side to insure a clean cut. Right, principles of pruning a Floribunda. The cutting back of this class of rose is usually not as severe as on a Hybrid Tea.



Left, principles of pruning Hybrid Tea roses: (A) high pruning for more and earlier blooms; (B) pruning to remove twiggy and cross branches; (C) pruning 1 inch below a canker; (D) severe pruning for removal of winter damage; (E) removal of sucker from understock. "Bud union" marks region at which plant was grafted.

Ollila

ease in spraying. Remove cross branches.

Sometimes it is difficult to keep the symmetry of the bushes since the new canes may not have forced out in the most desirable location. Rather than cutting out good new or old canes because they are too close together, spread them apart by inserting a forked branch between them. This "spacer" may be left in place for the rest of the season.

As the plants begin to show leaves in the spring, some of the buds may grow strongly towards the center of the plant. These may be easily removed by pushing them off with your fingers. If there are three buds forcing out from one node, it is well to push the two side or weaker buds off and let all the strength go into one cane. Candelabra canes which emerge from the bud union and grow so strongly that they tower above the rest of the plant may be controlled by pinching the tip when they are about fifteen inches tall. This will slow the growth and cause them to branch lower.

Suckers may appear on plants. These are long canes which have different foliage from the rest of the bush and sometimes smaller flowers of different color and form. A sucker grows from the rootstock and emerges from below the bud union. Suckers should be eliminated or they may outgrow your plant. They should be cut off at their point of origin. It may be necessary to use a trowel to dig below the ground level to see where they have started. Remove them completely, cutting into the root if you must.

Individual cuts should be made with sharp pruning shears to prevent mashing the canes. A small saw and long-handled lopping shears may be needed for heavier canes on older plants and getting into hard-to-reach places. Do not force your pruning shears when cutting heavy wood or you may throw them out of alignment. Cuts should be made at a 45-60° angle about one-fourth inch above a bud. Where there is a leaf on the plant there is a bud. The new growth will grow in the direction the leaf is pointing, so the cut should be made just above a leaf that is pointing to the outside of the plant. Exceptions would be where the plant has grown too vigorously over a path or is spreading and you would like to confine it and get greater height. Then cut to an inside eye.

Treatment for Special Kinds

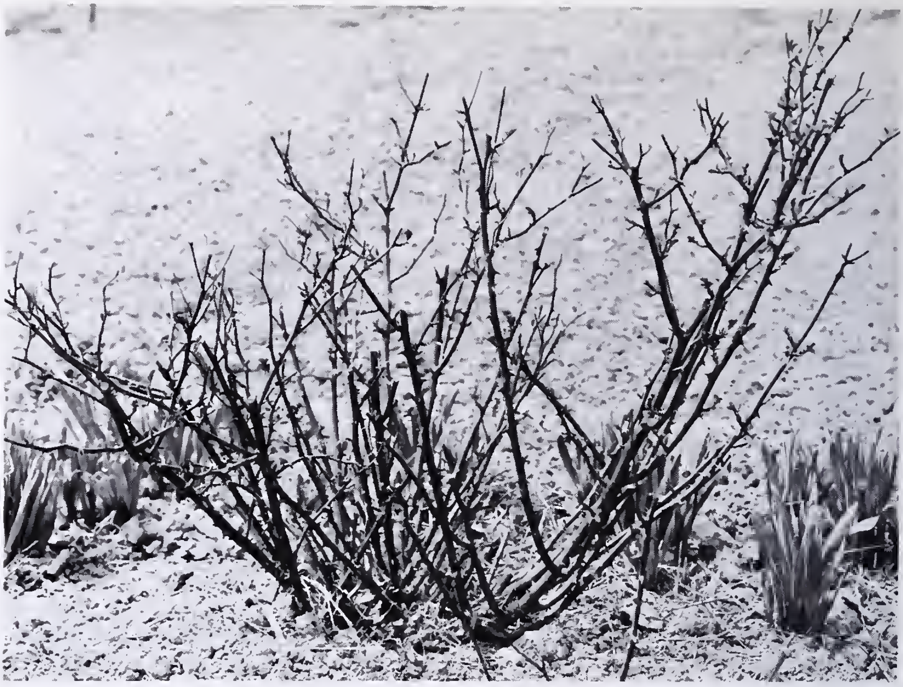
Hybrid teas and grandifloras may be cut back about one-third to one-half. Floribundas may be pruned more lightly—about one-fourth—with more branching left at the top. The older canes of climbing roses, such as the climbing hybrid teas of 'Peace', 'Chrysler' and 'Talisman', may be removed to the base. The newer canes which forced out during the past season but did not bloom will bloom the coming season. Do not shorten these canes to three feet as you will be cutting off wood that will bloom in the spring. It is well to leave a combination of old and new wood. The flowering spurs on the old wood may be cut back to two or three eyes. Leave six to eight canes to be tied horizontally on your fence as more flowers are produced if the canes are parallel to the ground rather than standing upright.

The old-fashioned and species roses are pruned lightly. Remove any dead wood and small spindly branches. The Bourbons and hybrid perpetuals may be pruned more severely. The teas may be cut back as you would a floribunda. Species such as 'Austrian Copper' may be thinned and shortened lightly. There will be a greater display of bloom if the canes can be arched and pegged to the ground.

Tree roses do not renew themselves with new basal canes for as long as regular bushes do, so remove few canes to the bud union. Keep the centers open and shorten the canes by about half.

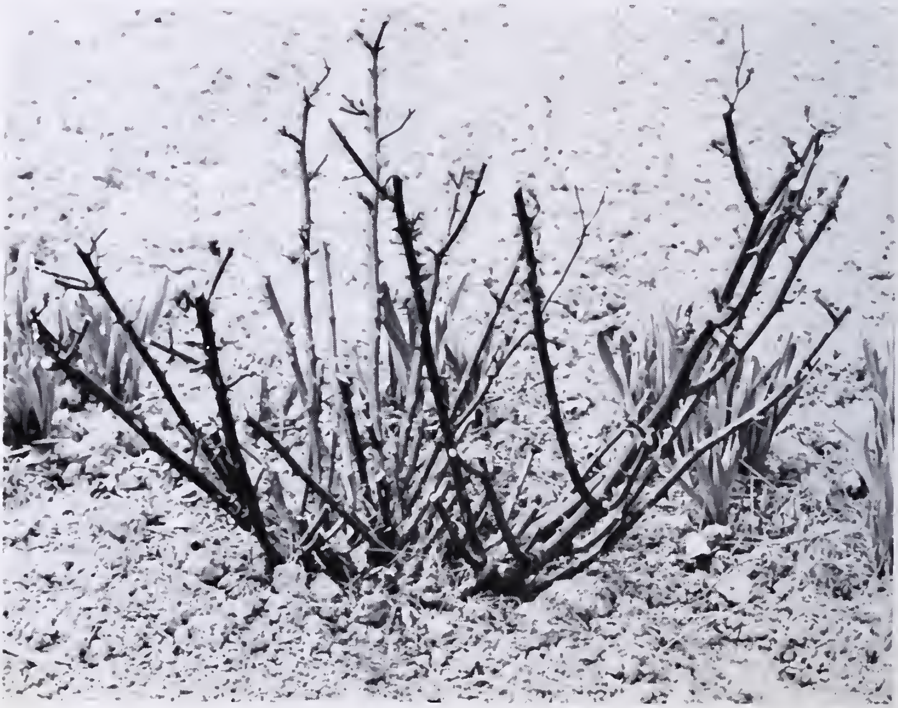
After you have completed pruning, remove all leaves from the plant and rake the ground to eliminate a possible source of over-wintering insects or disease spores. It is well to give the plants a dormant spray, especially if you had problems with insects, mites or disease during the past growing season.

Roses are very rugged plants and will survive your pruning mistakes. A moderate and reasoned approach will produce an abundance of bloom for you in the coming season.



Photos: Roche

Before and after pruning a shrub rose. Note how many small canes, suckers and twigs have been removed. ✿



Herman Gantner

In very cold areas it makes sense to give . . .

WINTER PROTECTION

John E. Voight

Growing roses has long been the subject of rules as sententious as the Ten Commandments. The important matter of wintering these plants in cold parts of the country has itself been contradictory. Again and again, common sense comes to the rescue!

In areas where subzero temperatures are common, most types of modern roses need the heaviest winter protection or they will be weakened or lost completely. In areas where temperatures occasionally drop to zero or below, some protection may be needed, depending mainly on the exposure of the plants. (*Ed.*—None is necessary at Brooklyn Botanic Garden except for tree roses.) In the lower South or parts of the West where temperatures seldom get below 10°F, it is unnecessary to protect roses.

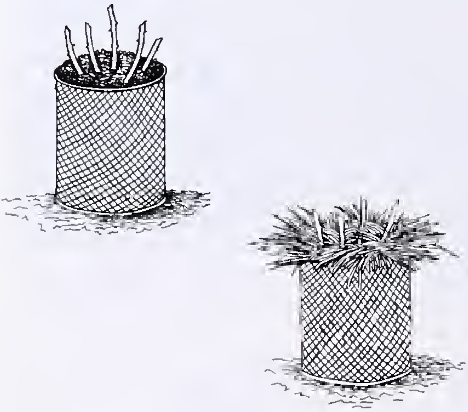
The first principle of winter protection, regardless of the area, is to make sure the rose is in peak health as it goes into winter. A healthy rose bush is a hardy plant; it is as simple as that. A rose that has been beset with fungal and insect infestations, or one that has suffered drought, will not have the healthy leaf system required to manufacture sugar and starch for storage over winter. Watering practices in the colder climates, however, should generally cease in mid-September.

Other factors that should be considered are the ripeness of the wood, the length of the hardening-off period, autumn temperatures, rainfall, planting exposure and also the inherent nature of the varieties. Roses that are not protected when the temperature regularly drops below 20°F for long periods of time may be damaged or killed regardless of area. The time to start protection will vary depending upon the season and locality. Here in Wisconsin it begins about October 20.

Methods for Cold Climates

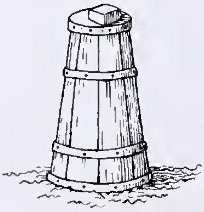
Soil Mound. Nature provides the best material there is—soil. Good, old dirt soil.

This popular method in the colder climates for protecting hybrid teas, grandifloras and polyanthas begins with tying each bush with binder twine to make the plant compact. A quarter-inch mesh hardware cloth cylinder is placed around each individual plant. The cylinder is then filled with soil. Ground level should be checked in due time for settling and soil added if necessary.

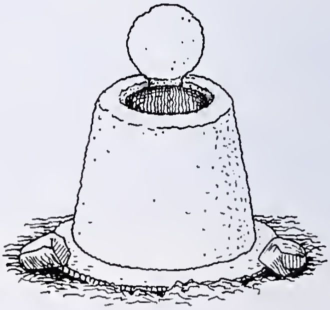


The main purpose of the wire cylinder is to conserve soil. If only a few plants are involved, it is sufficient to merely mound the soil around the base of each plant. Miniature roses can be handled successfully in the same manner.

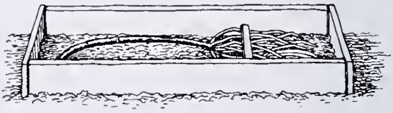
As soon as the ground is frozen solid, a layer of marsh hay is spread over the bed. Marsh hay is recommended because it is relatively weed-free and does not hold much moisture. Pruning of roses, regardless of climatic zones, should be left for the plant's dormancy period, ending as the new spring buds begin to swell. Bean hampers, if available, may be used and placed over soil-mounded plants to aid in salvaging more wood. Prune canes only to meet the height and diameter needs to clear contact with the basket.

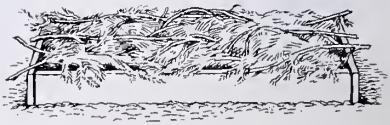


In the colder regions many rose growers have had great success with styrofoam cones, which are handled the same as the bean hampers. It is advisable to purchase cones with a removable or hinged cover that can be opened for ventilation during warm days to prevent moisture from condensing inside. Cones and hampers should be anchored with soil or stones on the bottom flanges or they are apt to be blown over by high winds.

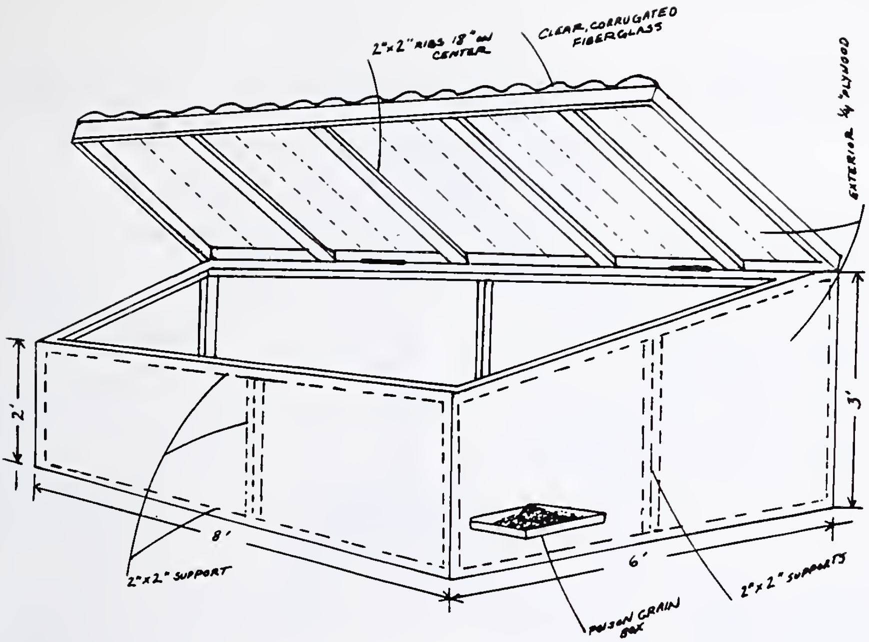


Climbers and Tree Roses. In the colder climates, winter protection of climbers and tree roses becomes a unique problem. The common technique is to decide the direction in which the climber or tree rose is to rest. The plant is loosened from the soil in a semi-circle a foot or more from the base. Then the plant is bent down gently but firmly and pegged securely with wood lath. Boards may be placed





Eva Melady



Author

A plywood and fiberglass rose shelter, hinged for ventilation.

around the climbers or tree roses to add insulation and conserve soil. Then the plant is completely covered with soil. Marsh hay, cornstalks or evergreen boughs are placed over the surface after the soil is frozen solid. This is a drastic and laborious method, yet it's the simplest and easiest way to bring climbers and tree roses through winter in cold climates.

Rose Shelter Method. Another successful method for protecting roses in very cold climates employs a shelter over the entire bed. This is really nothing more than a portable coldframe. A well-ventilated structure with a light-transmitting roof gives excellent results. The roof is constructed of a clear, corrugated fiberglass that provides the necessary light and ventilation. The sides are constructed of a marine type of plywood, construction grade. To join the various sections, a door hinge with a removable pin works well. The roof should be constructed so it can be opened when the temperature gets warm. When there is danger of the temperature dropping to the mid-twenties, the top should be secured. Mice can be a problem so the shelter should be equipped with waterproof poison bait. In spring this shelter can double as a coldframe for hardening off plants that were housed indoors during the winter months.

Older Classes of Roses. Hybrid perpetuals don't need as much protection in subzero areas as hybrid teas. The best insurance may be to heel such roses with soil. The old-fashioned roses such as gallicas, moss, centifolias, damasks and other shrub roses are considered fully hardy without protection, even in southern Canada.

Removal of Winter Protection

The removal of winter protection requires timely judgment in severe climates. Marsh hay or similar covering material is gradually taken off, keeping the soil mounds intact until the danger of hard freezes has past. The soil mounds are then removed, preferably on an overcast day to avoid damage of new, tender growth.

For terraces and patios . . .

GROWING ROSES IN CONTAINERS

Elvin McDonald

If, as it is alleged, Cleopatra grew roses in containers on her barge, then the idea of the movable rose is hardly new. However, it is a practice that did not become widespread in North America until well after World War II, an offspring you might say of the marriage of two increasingly popular activities: terrace and patio living and container gardening. For the person whose outdoor gardening space is limited, perhaps, to a high-rise terrace, hardly any other plant can offer what the rose does—flowers throughout the growing season, fragrance, bouquets to enjoy fresh indoors, then sweet-smelling petals to add to potpourri.

Another reason so many of us are growing roses in containers is the vast improvement since the early 1960's of the miniatures. There are now miniatures in virtually every color found in other roses, plus varieties with mossing like the old-fashioned moss roses, miniature standards or trees two to three feet tall and hanging-basket types.

The other major reason people are growing roses in pots is because local nurseries and garden centers now sell rosebushes of all types—hybrid tea, grandiflora and floribunda—already growing in containers. This means that by the time roses are blooming in outdoor gardens in your area you can go to a nursery and select the varieties you like best by seeing and smelling real blooms instead of looking at catalog photographs. On the other hand, if you want some adventure, it can be just as much fun and fully as rewarding to select from catalogs, or to purchase containerized roses locally which may show buds but have no open flowers for you to sniff and admire.

For Best Performance

The single most important thing to remember if you want to be a rosarian whose roses have mobility is that they need soil that is constantly moist. If the soil dries out severely even one time the bush will suffer tremendous stress which you will see by the number of dead leaves and withered new growth tips.

Since roses need at least a half day of direct sun, this means that there will be considerable heat buildup in and around the containers, especially if they are placed on an exposed terrace or rooftop. Standard-size rosebushes need containers at least twelve inches in diameter and as deep or deeper. The miniatures will do well in six-inch pots. Obviously, the larger the container, the better it will retain moisture. For this reason, you will probably have better luck with the miniatures if you group several together in one sizable planter, perhaps eight inches deep and two feet in diameter; a container of this size will hold five bushes with perhaps one miniature tree in the center. Remember that the soil in unglazed clay will dry out more quickly than that in other types of containers.

Container roses need a rich, well-drained potting soil. You can mix your own by combining two parts each of packaged all-purpose potting soil and sphagnum peat moss with one part each of clean, sharp sand (or perlite) and well-rotted or dehydrated cow manure. Before adding this mix to the container, place a layer of drainage material in the bottom; this can be an inch of pebbles or pot shards in a small pot or shallow planter for miniatures, and up to two inches in deep pots, tubs or planters twelve inches in diameter or larger.

To plant, remove the rose from the container in which it has been growing. Place the rootball in its intended container with enough potting soil underneath so that it will be at the same level in the soil as before. Pack potting soil all around so there will be no air pockets, then saturate with water. Begin feeding

Eva Melady

regularly with a rose fertilizer two weeks later and continue throughout the growing season. To control insect pests and diseases, apply an all-purpose systemic rose pesticide in granular form to the soil surface, then water well.

Winter Care North and South

In climates where winter temperatures regularly drop below 20°F, containerized roses will have a higher rate of survival if moved, after the first killing frost, to an unheated garage or out-building, a deep coldframe or pit greenhouse. Prune back any excessively long or tall canes at this time, but wait until planting-out weather in the spring to do the full-fledged annual pruning. Be sure the growing medium is nicely moist at the time of winter freeze-up. If you must keep container roses on a high-rise terrace or rooftop in a cold climate, push them all together against a protecting wall, moisten the soil thoroughly, mulch generously with salt hay, then cover with a tarpaulin tied securely in place.

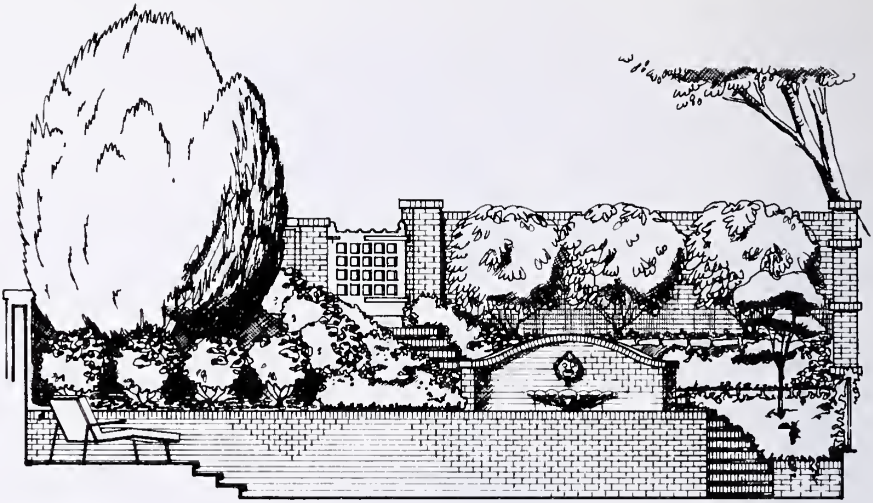
If you live in a mild climate where winter temperatures rarely drop below 20°F, containerized roses can be brought through the dormant season any convenient place outdoors, perhaps left standing exactly where they have been growing. Just be sure the growing medium is moist at all times, especially during any period of sunny, unseasonably warm weather. Also, if the wintering-over place is exposed to strong winds, as on a high-rise terrace, prune back any canes subject to whipping, otherwise roots may be broken.

Other tips for success with roses in containers include:

At the beginning of the growing season in the second and succeeding years, use your fingers to remove the top two or three inches of old growing medium and replace with fresh; this is called top-dressing and takes the place of all-out repotting.

If you live where summers tend to be extremely hot and dry, devise some means for keeping the containers shaded while the rosebushes themselves are in the sun. This keeps soil temperatures down and reduces the amount of watering you'll have to do.

Wood cleats placed under wooden planter boxes, large clay pots or other containers will increase air circulation, thus reducing heat buildup, while at the same time assuring rapid runoff of excess moisture.



elevation **plan no. 4**

All drawings by author

A prominent landscape architect suggests . . .

ROSES— DESIGN YOUR GARDEN FOR THEM

Ernest Wertheim

No palace revolution could ever tumble the rose from her status as Queen of the Flowers. Roses are the source of wines, dyes, medicaments, oils, perfumes, pomanders and potpourris. When they are in season, they are the most spectacular and conspicuous ornaments in the garden. Roses have decorated the grandest of feasts, have often been the flower of weddings, and are the symbol of love. No wonder then that many home gardeners wish to include the rose as a part of the landscape.

Planning

To decide where we might plant one rose, or several roses, or establish a rose garden, we should first concern ourselves with some of the basics of landscape design. The garden should provide a beautiful setting for the house and lovely vistas when seen from the windows. Garden spaces influence indoor comfort, and in the milder portion of the year can be developed into extensions of the living space of the house.

Home planning, then, must include both indoors and outdoors. It is a project for complete control of the space we live in, the things we see, and the use and maintenance of that space. What better place to relax than to be in the garden and absorb the beauty of the flowers of a rose garden, or inhale their wonderful perfume, or, if it is winter, to study the shape of the plants and prune away those old stocks so that new ones can take their place.

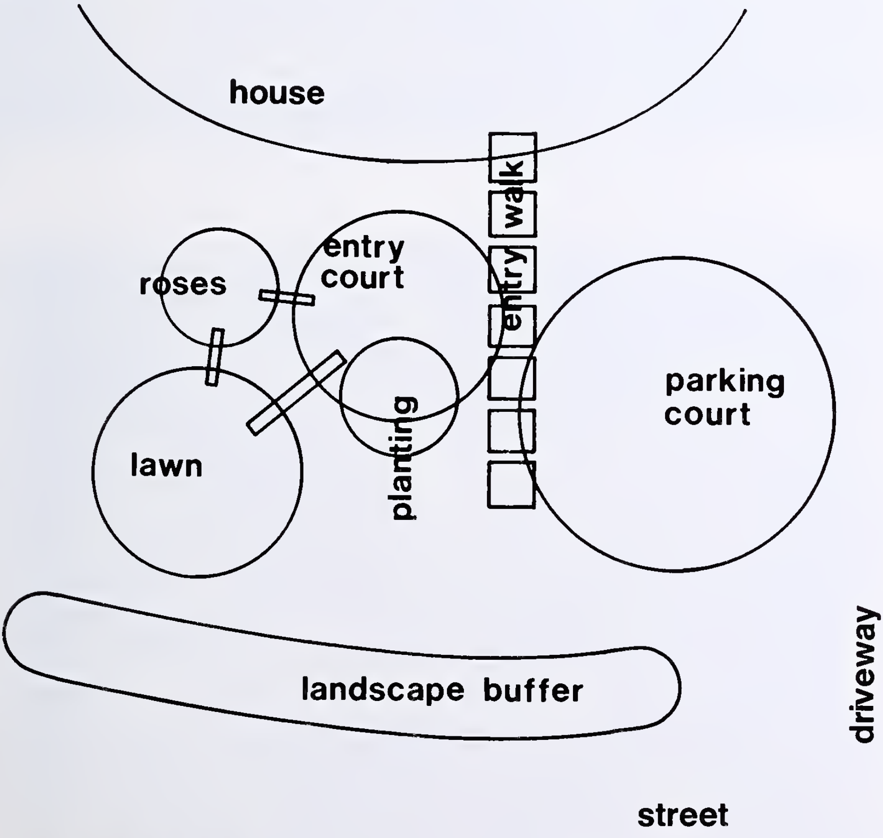
The challenges of home planning are similar throughout the country because human needs and desires are basically similar; it is the surrounding conditions which vary. All homes must provide in one way or another four main functions:

public access, general living, work space, and private living.

The first thing to be done is to prepare a site plan illustrating the existing conditions. Two of the major requirements for the design of a garden are utility and beauty; spaces should be produced that are both useful and beautiful. Useful should mean comfortable, convenient, workable or productive, and beautiful means that the garden gives us a pleasant, inspiring or relaxing sensation. The garden may be warm or cool, calm or exciting, simple or intricate, formal or informal, colorful or quiet, and filled with vegetation or structures. If the garden is beautiful, we have an experience that is remembered, and we will wish to return.

A garden must be developed so that there is a good relationship between house and garden, and between garden and neighbors. When it comes down to details each space within the garden must have a good relationship to another.

After a list of requirements for the outdoor areas has been prepared a "bubble" diagram can be completed; each "bubble" should be representative of the size required for a specific function, and its position in relationship to the other "bubbles" considered. The requirements may include such items as: driveway with space for guest parking; public access and private access to both the house and garden; service entrance, service yard, laundry yard and dog run; play area for children; swimming pool, ornamental pool or fountain; outdoor sitting area; low maintenance type garden; lawn area for visual effect and play; shade structure for both



bubble diagram

George Taloumis

Whether to soften an austere New England house front . . .

people and shade loving plants; arbor for vines or grapes; gardener's nook—greenhouse, lath house, potting bench, soil storage and tool storage; types of plant areas—perennial border, vegetable garden, flower garden, rose garden (formal or informal), space to grow fruit trees and berries.

When preparing this diagram, consideration should be given to sun and shade, warm and cold areas, direction of prevailing winds (both summer and winter), and private and non-private areas.

This "bubble" planning stage may take a little time or a lot, depending on how difficult the site might be, how exacting and complicated the requirements might be, and how well you are capable of visualizing the plan on paper. If you have trouble visualizing things on paper, you might get stakes and string and lay your diagram out on the site. Use a watering hose to create curved lines. It may be helpful to make a scale model of the site and study the relationship of the various elements. This is particularly true when dealing with a site that varies in grade.

Once you have arrived at a rough schematic solution that appears to answer all your requirements, the final design can commence. This is the stage when decisions must be made about the kinds of materials to be used; what precise form and arrangement to give them; how much construction and how much shelter; how to enrich the garden with fine colors, textures and forms; how to make drainage work; how to provide irrigation, lighting and spaces for garden sculpture.

Each decision affects the other. If for example a formal rose garden is to be included, it will influence the concept of the total design. Materials, forms and arrangement all go together. More construction means less planting and therefore more initial outlay, but less continuous maintenance (and vice versa). Enclosures and shelter are the primary forming elements of garden spaces giving them order, character and quality.

During the last forty years many changes have taken place in landscape design; it has become more sensitive, more sophisticated, more variable, and less bound by precedent and convention. Formal and informal design, once carefully segregated, have integrated and produced the diversified new rich forms. It is recommended that the homeowner read books by some of the well-known landscape architects in this country such as Douglas Baylis, Thomas Church, Garrett Eckbo, Lawrence Halprin, Dan Kiley, Robert Royston, Hideo Sasaki and John Ormsbee Simonds. Although these books may at times be heavy reading, they are full of good information and have many fine illustrations.

A Few Sketches for Using Roses

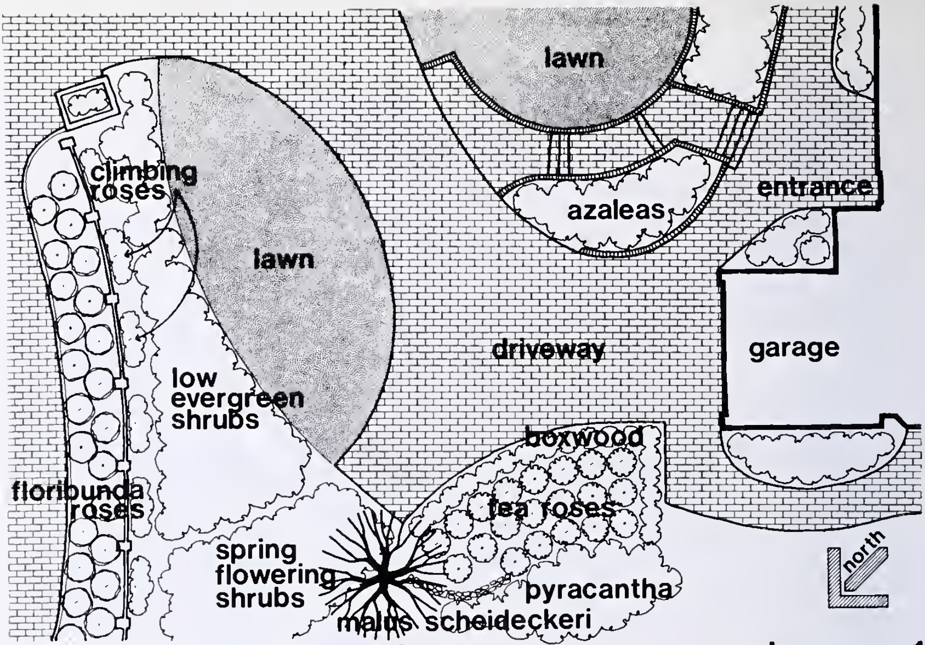
To return specifically to roses in residential gardens, several sketches have been prepared to illustrate their use. The varieties mentioned are those used on these plans. Individual tastes and climatic conditions may dictate selection of different varieties. Plan No. 1 is a partial design of a front garden in California. Along the street on the public side of the fence is a mass planting of rose 'Circus'. On the fence is the climbing rose 'Mrs. Sam McGredy'. The fence is of wrought iron with brick pillars, which gives the owner and passerby an opportunity to see the planting at both sides of it.

The hybrid tea roses are located to the side of the driveway with dwarf English box (*Buxus sempervirens* 'Suffruticosa') as an edging (not hardy everywhere). The varieties of hybrid teas are 'Tropicana', 'Fragrant Cloud', 'Summer Sunshine' and 'Peace'. Care should be taken to use the less vigorous varieties to the front of the bed with the taller ones to the rear. Because there are several bushes of one variety, the chance of picking a bouquet is increased.

Pyracantha was selected to give color through its orange or red berries in the fall and early winter when the roses are declining to bloom. For early spring bloom a crab apple, *Malus scheideckeri*, with attractive pale pink flowers, was placed on the north side of the rose planting so that it will not throw shade on the roses. This California garden has roses in

. . . or accent areas on an informal terrace, roses are a lively, fragrant addition.

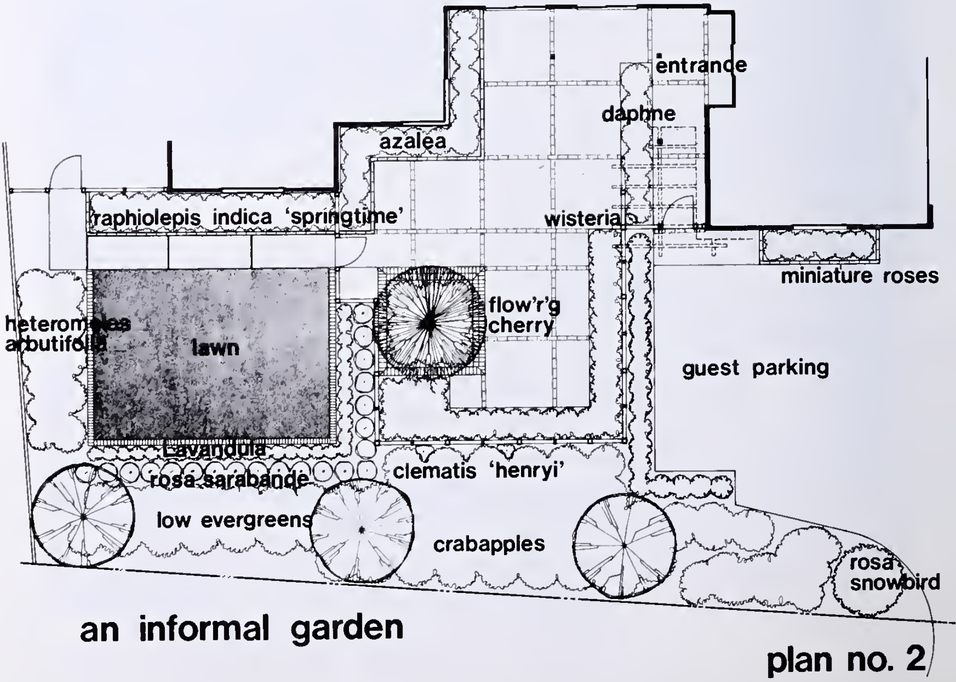
Roche



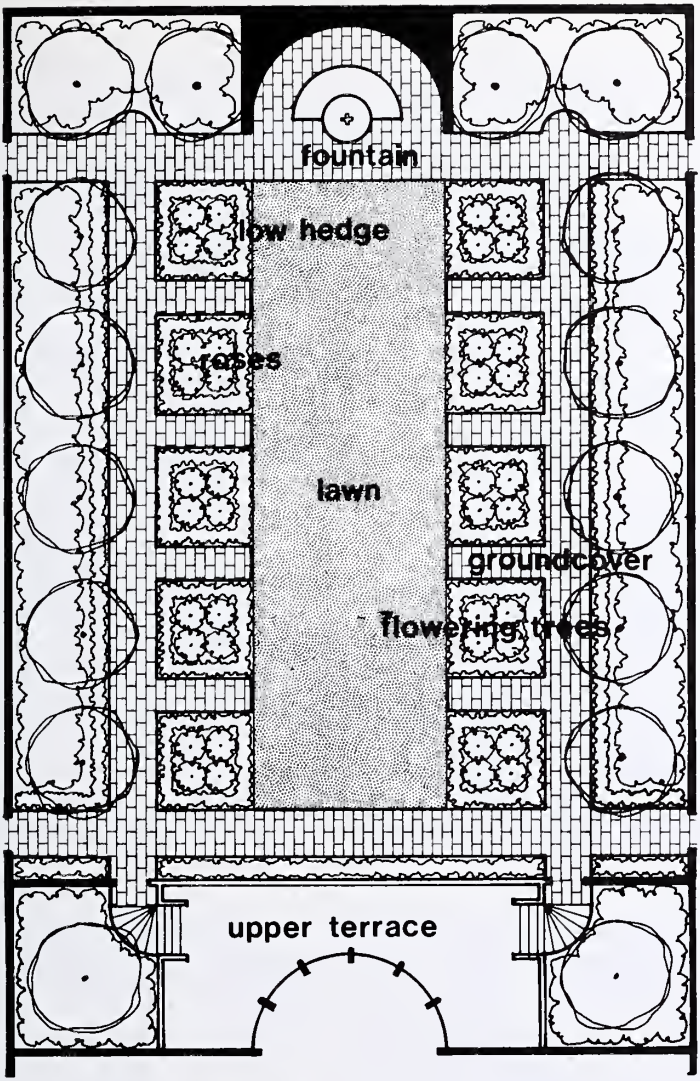
an informal front garden plan no. 1

bloom between late April and December.

Plan No. 2 illustrates a front garden which is partially private and partially exposed to the street. The visitor has to enter through a gate and is then surprised by the very intimate space where the owner can enjoy the sun without being seen from the street. The front patio is completely enclosed. On the outside of the enclosed patio is a small lawn which is edged by rose 'Sarabande'. It provides color in this California garden for more



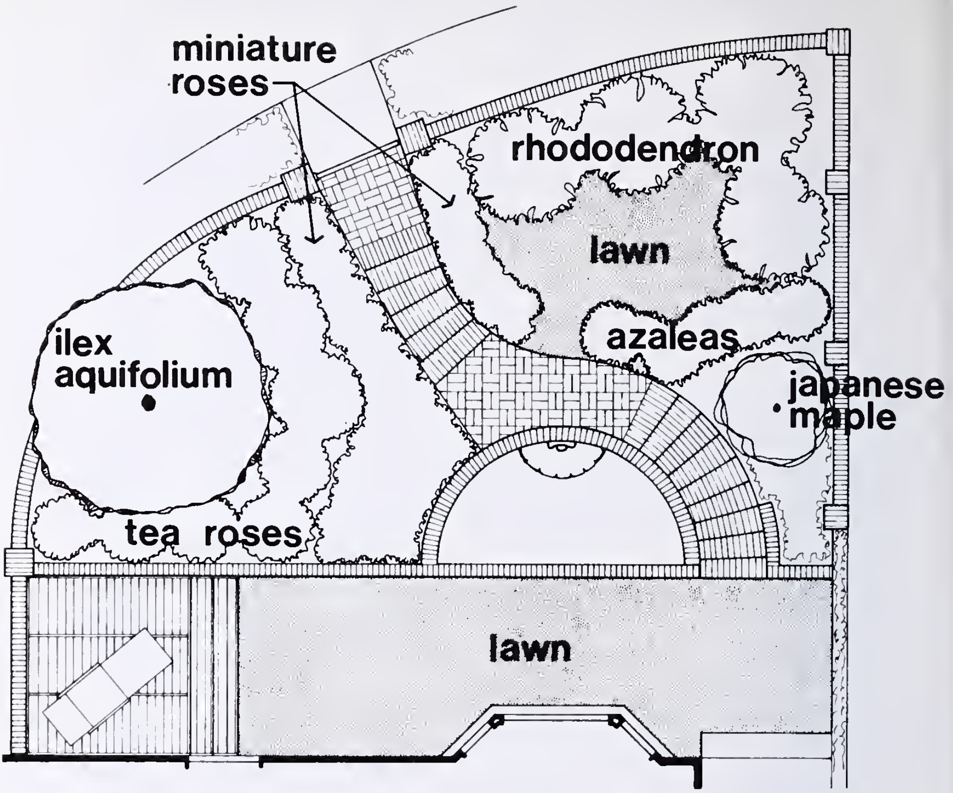
an informal garden plan no. 2



a formal garden **plan no. 3**

than six months. There is little maintenance connected with this planting. The edging between the lawn and the roses is a compact form of lavender, *Lavandula angustifolia* 'Hidcote'. The groundcover along the street is Sargent juniper (*Juniperus chinensis* 'Sargentii', and the trees are *Malus* 'Katherine', a pink, double-flowering crab apple. Inside the brick planter is a light pink flowering cherry (*Prunus yedoensis* 'Akebono') with annuals below. The flowering cherry blooms earlier than the crab apple; both of them, however, are through before the rose starts to flower. The lavender blooms during the summer. Winter color is provided by the red berries of a California native-shrub, toyon (*Heteromeles arbutifolia*).

Plan No. 3 has roses as the dominant feature in a wall-enclosed garden. The vista created by the lawn leads the eye from the terrace to the fountain and the semi-circular brick wall. The flowering trees on the sides and end will bloom prior to the roses, and they give a feeling of height, and help to create a sense of enclosure.



small garden plan no. 4

The four hybrid tea roses in each square should be the same variety. Darker reds could be used near the fountain with the color in each square getting lighter as they come toward the terrace and entrance to the garden. All the beds are edged with a clipped hedge such as boxwood, hebe, lavender or germander. The wall that encloses the garden is brick.

Plan No. 4 is a small San Francisco garden which was designed to be viewed from a bay window. The fountain creates a lovely water effect and the pool is stocked with exotic fish. The garden lights provide the owner with a nice night effect.

The wood platform provides a small space for relaxing and sunning, and the brick walls create complete privacy. The garden gate leads to the street but is not the main entrance to the house. The large tree is an existing English holly (*Ilex aquifolium*) which is heavily covered with red berries during winter. Around the edge of this beautiful holly are 'Peace' roses, and along the brick walk is a mass planting of miniature roses. Early spring color is provided by the fragrant white flowers of *Rhododendron* 'Forsteranum'.

Climbers

Mention should be made of the spectacular climbing rose 'Mrs. Sam McGredy', which is on a split rail fence at the Sunset Magazine headquarters in Menlo Park, California. This planting extends over two hundred feet with each plant being located between two rail-type posts about eight feet on center. When in bloom this lovely, fragrant rose makes a beautiful display, and when not in bloom the young reddish foliage is lovely to look at, in particular with the green lawn as a backdrop. Maintenance is relatively easy because the gardener can get at the plants from two sides. This rose, not readily available any more, is listed by Stocking's Rose Nursery in San Jose, California.

When a climbing rose is used on a porch post, a variety should be chosen that is not too rampant in habit or growth; 'High Noon' or 'Royal Gold' would be good choices. The vigorous climbers should be used mainly on walls or arbors where they have plenty of room to expand. Pruning of the more vigorous roses may present a problem for the average homeowner.

Climbing roses can be successfully used on banks, not only for beauty but for erosion control. A favorite rose in mild climates for this purpose is the yellow-flowered form of the Banksia rose (*Rosa banksiae* 'Lutea'). This rose is not easy to find, although it is listed in the current catalog of Monrovia Nursery in Azusa, California, a leading wholesaler. This author understands that Monrovia's plants are on their own roots which creates better plants for the purpose of bank planting. The yellow form also makes a lovely display when used on fences. The white form 'Alba Plena' is equally good. Both are thornless or nearly so.

In mild climates *Rosa bracteata* 'Mermaid' can be used on large banks where there is a lot of room for expansion. In cold climates the white-flowered *Rosa wichuraiana* would be a good choice for a ground cover. Both 'Mermaid' and *R. wichuraiana* need plenty of space.

'Snowbird' is another fine climber that can be used on banks. The soft green foliage is a lovely contrast to the abundant white flowers which are fragrant. This rose can be used as an accent between a mass planting of low junipers or weeping English yew (*Taxus baccata* 'Repandens').

Some Uses for Different Kinds

Roses are not only for the home garden but are useful on commercial and institutional landscapes as well. Ted Osmundson, landscape architect for Kaiser Industries Headquarters in Oakland, California, has successfully used masses of 'Sarabande' and other floribundas on the building's roof garden. The City of Walnut Creek, California, has also used 'Sarabande' to fine effect; it planted five hundred in a downtown media strip, and the roses are doing well and are not affected by auto exhaust fumes.

Most roses need attention and the gardener who devotes a lot of love and care is often rewarded with excellent results. There are, however, some roses that don't require much, if any, care. In a revegetation project in the high Sierras near Lake Tahoe, *Rosa woodsii ultra-montana* was used, and it was found that this plant not only tolerated drought conditions well, but produced more growth per year than some of the other native shrubs. This rose was used in mass, and although it is not spectacular when in bloom, the pink blossoms appear throughout summer, followed by colorful fruit in autumn. The plants survive without supplements or feeding, and with no water other than the natural rain and snow fall. This rose has underground runners which help make it valuable for erosion control.

Miniature roses should also be mentioned. They can be used individually or in groups. Some of the miniatures have been used very successfully in rock gardens, while others have been used as edgings to flower beds, or in mass plantings around an ornamental pool. In mild climates the miniature rose is used in low pottery bowls and placed at entrance porches, on patios or on balconies of apartments. The tree form also makes a good subject for containers.

Roses, whether old or new varieties, bush or tree, climber or miniature, all produce beautiful blossoms in many various colors. Before selecting roses for the garden you should become aware of the various individual habits of growth, colors and compatibility with other roses and plants. Great care should be taken when combining colors with one another; an abundance of flowers and colors will not necessarily produce the gaiety one might expect, it may instead create confusion. Beauty and delight are not born of merely profuse and bright colors, rather they are brought out by the brilliance of the flowers silhouetted against a background. For this reason it is essential to remember to give thought to surroundings when planting roses, regardless of whether a formal or informal garden is planned.

ROSES IN THE LAND-SCAPE

Left, George Taloumis; below, Roche; opposite, Gottscho-Schleisner

Roses in formal settings: left, in tubs on either side of French doors; below, the Rose Garden at Mount Juliet, Ireland.

Roses cascade over rocks above a formal lawn with rural river view.

Opposite, above, Herman Gantner; all others, Roche

Roses in garden settings: above, with ivy and white alyssum to soften a stone wall; left, shrub roses below and climbers above a wall give progressive visual heights back to the mature evergreens.

Right, climbers can create a mass of color as well as an impenetrable barrier; below, 'Peace' roses break up the formal symmetry of boxwood hedges and sundial.

Roses in informal settings: left, rambling on a split-rail fence; below, *Rosa rugosa* as a visual divider between lawn and ocean.

Opposite, below, Jackson & Perkins Co.; all others, George Taloumis

Right, roses trained across the front of a weathered-shingle Cape Cod vacation cottage soften its austerity. Below, roses seem to spew from the fir trees onto the lawn.

All illustrations by author

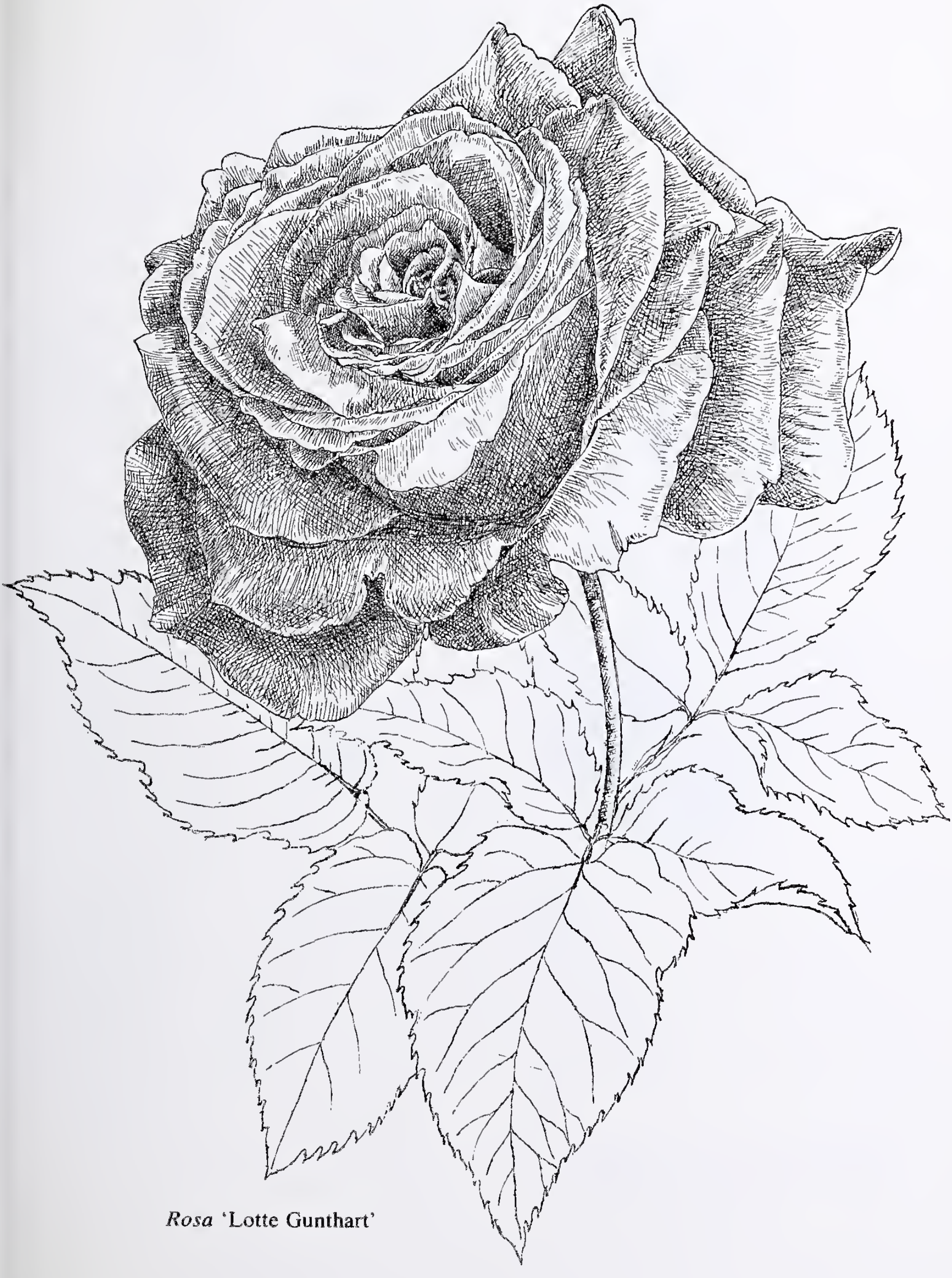
How I paint a rose . . .

ROSES IN THE WORLD OF ART

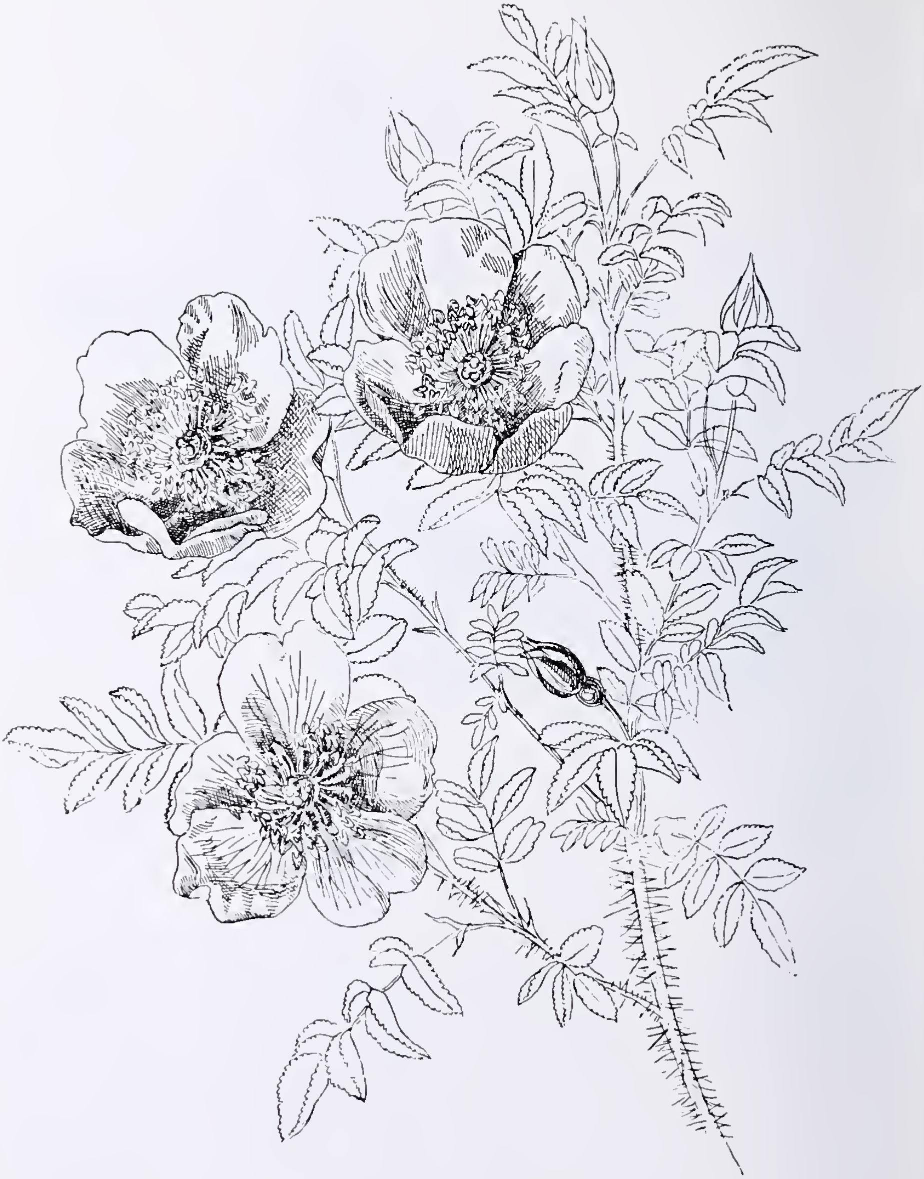
Lotte Gunthart

Eighty different species of hybrid tea roses and over two hundred old shrub roses are blooming in our garden in Switzerland. They are all my models, because I paint only living roses, nor should I want to do otherwise. Needless to say, it would be much simpler to paint from a photograph; the rose would keep still and never change, and I could take my time painting it. To paint a living rose, full concentration, patience and stamina are needed. Since a rose bloom changes fairly quickly, I try to capture its exact outline on paper as quickly and yet accurately as possible. This is why everything in my studio is prepared the day before. The brushes are tidily arranged on the piece of paper I will use to test the colors. I always mix the watercolors directly on a sheet of paper similar to the one on which I will paint. This enables me to test the exact shade.

I cut my rose from the garden early in the morning. In the studio, I turn the rose until I face its most beautiful side and begin to lightly sketch it with a soft pencil. When the first sketch is completed, I take a carefully sharpened hard pencil and accurately retrace the line of the bloom. This requires patience and might seem boring, but for me it is fascinating and exciting to observe how one petal after another falls into place and takes shape. It is like a mathematical problem



Rosa 'Lotte Gunthart'



Rosa spinosissima pimpernellifolia

Rosa 'Sparrieshoop'

which has to be solved, and as I penetrate into the secrets of the most exquisite of flowers, I feel that creation is good and wonderful. I like to listen to the music of Bach while doing the preliminary draft.

All this is successful only if, in fact, the object does stay still. How often, within only one hour, the petals gently uncurl to present me with a completely different picture. Then I have to begin all over again, having already lost two valuable hours of the day. If luck is with me, I carry on painting as soon as I have finished the pencil sketch. And provided that the rose does not wilt within those first few vital hours, I have at least a good chance to capture its fresh beauty. I then add the fine distinction of color and form throughout the remaining hours of daylight. Because the leaves, stems and thorns do not change as fast, I can paint those with leisure in the next few days. I can even take a short break for lunch. On the first day I merely drink a lot of sweet strong coffee, because the model will not allow me any time to eat. I can see that its impatient petals are ready to uncurl.

There are single-blooming roses which drive me to despair with their restlessness and mobility. Early one morning I picked an apothecary rose (*Rosa gallica officinalis*) whose petals were firmly closed. I began my sketch as soon as the petals opened, and was able to see inside the rose. The drawing of this solitary flower was completed after a full hour. But in the meantime, my apothecary rose had opened wide. Its petals were almost turned back and I had to start my patient work all over again.

A few years ago, the 'Queen of Denmark' was blooming unusually well, and I decided to tackle the task of painting this rose with its well-over-one-hundred petals. Getting these tiny petals to coincide exactly in the middle of the drawing, as they do in the living model, is a very difficult job. After many hours of concentrated work, I managed to reproduce the many petals with extreme accuracy. But I always get symptoms of stage fright when beginning a new picture like this! A sudden depression comes over me, as I begin to doubt my own artistic ability.

The 'Queen's' petals were easier to paint than the large petals of the apothecary rose. With the latter, in order to represent the velvety soft transitions from the lightest pink to the darkest, deepest purple, I often have to apply up to twenty layers on top of one another with a dry brush. I bring out the light spots by leaving blanks when I begin to paint. My Berlin teacher, Professor G. Ulrich, showed me this dry brush technique which I use for all my rose portraits.

Finally, in the evening, when one of my roses is completed on its sheet of paper, I put my brush down, feeling tired, but satisfied and at peace. I look forward to a relaxing glass of wine, dinner, darkness and sleep. The following days I paint the stems, the leaves and the thorns. Once again I have to apply at least twenty layers of paint with a dry brush to achieve the deep, lush, luxuriant green and the soft transitions from light to dark.

One does not observe the grace and the movement of the stems until they are shown full length and adorned with their many leaves. This is why I am so fond of Redouté roses. He never painted those short stems, cut in a straight line, which are found in so many pictures. His roses are dancers and queens, full of soul and charm, lively and graceful. I think that these long stems, with their passionate movement, should harmoniously end with an elegant swinging motion. Even the thorns have a vitality of their own. One of the attractions of 'Elegance' is the fascination of its ruby-red thorns with their long, delicate curves. Here, too, there is variety, for the prickles can be green, reddish, red, yellow, purple, gray, brown and even black, all differing subtly in size and texture. Far from diminishing the loveliness of the whole rose, the thorns add to its beauty, a point so well expressed by the Persian poet Sa'di, when he wrote: "Not only the nightingale and the rose-bush are chanting the praises of God, but every thorn is a tongue to extol Him," or: "The treasure and the dragon, the rose and the thorn, sorrow and gladness are linked together."

I have some old French tea roses of which I am very fond, such as 'Souvenir de P. Nabonnand,' 'Leonie Viennot,' and 'La France'. They are small, delicate and

Rosa 'Schneewittchen'

very sensitive to cold and rain. But whenever one of these delightful roses blooms among its tender branches, I think of the following words: "Suffering is the golden cross upon which the rose of the soul unfoldeth." Thousands of years ago Amenhotep IV, Pharaoh of Egypt, placed these words on papyrus. By some strange coincidence, my 'Souvenir de P. Nabonnand' rose nearly always unfolds surrounded by tender branches forming a cross.

There are countless stories and symbols which are connected with the rose; for many thousands of years, this flower has moved and interested people more than any other. The Persian word for rose is *Gul*, which means "the mighty God." By the tomb of Tristan, King Mark bade his followers to plant a rose tree, and by that of Isolde, a rose vine. The two reached toward each other across the chapel and wove branches and roots so closely together that no man thereafter might separate them. Vita Sackville-West, who owned the beautiful gardens of Sissinghurst Castle in Kent, England, wrote about the "wine-dark, heavy-scented Rose who remains an Asiatic and a Roman. She is no maiden sweet, but deep and old and cunning in deceit, offering promises too near the thorn." And finally Dante made the rose the symbol of Paradise and Heaven. He wrote: "brighter than a million suns, immaculate, inaccessible, vast, fiery with magnificence, and surrounding God as if with a million veils." ☙

MINIATURE ROSES IN PATIO GARDENS

Harmon Saville

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American Rose Annual 1979 (American Rose Society)

A patio garden of miniature roses will solve the problem for those who feel they "have no space for roses." Certainly, anyone with a sunny outdoor living space such as a patio, a sundeck, a poolside area, a dooryard, a terrace or a porch has the space and the opportunity to have an exciting garden of miniature roses.

Any niche of soil that measures six inches or more across is all that is necessary to have a permanent, petite garden at the edge of patio paving, against a divider or back-drop fence. If the soil is very poor, it can be removed and replaced with a mixture that is ideal for growing miniature roses. The small volume required makes it possible to "make" the soil with desirable properties: tilth, fertility and pH.

Probably the most common permanent patio garden consists of an owner-designed planter. Any contraption that will hold soil at least six inches deep can be designed to fit the patio space. Frequently, these planters take the form of "horse troughs," which are used to define the edge of an intimate living area or to outline paths for traffic flow and separate different activity areas. One set of planters might outline the barbecue area with another surrounding an area furnished with chairs and tables. The planters may be raised from the ground or built up in steps. They can be made of wood, concrete or other suitable material that will fit into the patio design as an integral part of the decor. Shape and dimensions are entirely up to the individual.

For each small "micro-mini" plant, a soil volume of one-half cubic foot, (six-by-six-by-six inches), is all that is required. A full cubic foot of soil would be better for the larger size miniature plants. The only other requirements are a source of water and full sun for at least four hours (or more) per day with open shade for the balance of the day (nothing but sky overhead).

Portable Garden Features

Miniature roses are ideally suited for growing in patio pots, window boxes, planters and hanging baskets. They grow very well, very easily and produce top quality blooms. Being movable, it is possible to rotate plants in top condition to the most important areas of the living space.

Size of patio containers may be from eight inches in diameter to barrel size. The marketplace is exploding with innumerable kinds and types of containers for patio plants. Containers from eight to twelve inches in diameter are suitable for a single miniature rose. Larger planters can handle two or more plants. There is no problem in using several plants of the same variety for a large pot, but different varieties should be selected with an eye to complimentary plant habit and bloom color.

The container soil should be open and fast draining with a high humus content. A mixture of one-third good garden soil, one-third sphagnum peat moss or compost and one-third perlite will meet this requirement nicely for plastic, metal or glazed ceramic containers. An open soil is required to furnish air to the root area through the soil surface each time the pot is watered. A heavier soil (more loam and less perlite), should be used with containers of porous sidewalls such as clay, unglazed ceramics and wood. Air movement (and consequent drying) occurs partially through the sidewalls of porous pots, so it is not necessary to have such light open soil.

The most important single factor in successful patio container growing is

Photos by author

Miniature rose 'Hokey Pokey'

proper watering. The soil must *never* dry out, even for a short period. Because of the nature of the container, the soil dries much faster than soil in the ground! You may find that your containers will need to be watered every few days when the weather is cool and damp, and daily, or several times a day, when the weather is hot and dry.

Hanging baskets need special attention because they are surrounded by drying air and because they are above eye level and can escape notice until it is too late. An automatic watering system is worth considering, especially if the "head gardener" is not on duty at all times of the day. Grouping containers closely together helps reduce evaporation and allows a longer period between waterings. A too-large container needs less watering than a too-small one.

Container plants should be fertilized frequently and lightly with a complete fertilizer that is applied as a liquid. Read the directions on the container and feed at one-half the recommended rate, twice as often. The object is to try to provide a nearly constant level of available nutrients rather than a "shot" when they get hungry.

Plant symmetry is very important in patio containers especially if they are to be viewed from all sides. Plants that are described as "compact" and "bushy" should be selected. In the event that a strong basal cane develops, the growing tip should be "soft-pinched" to help achieve symmetry and force more com-

Miniature rose 'Chattem Centennial'

pact growth. The strength of the plant is thereby directed toward several smaller canes rather than a single candelabra cane.

Skillfull container growers are adept at keeping the container itself out of direct sun which results in overheating the root system. Look for ways to place the containers in the shade while allowing the plant to enjoy full light. One way this can be accomplished is to place the growing container within a large container made of solid wood or of slats. Sometimes the space between the growing pot and the outside container is filled with damp sphagnum peat to help cool and humidify and to reduce the need for more frequent waterings.

Some Miniatures for Patio Gardens

Every miniature rose fancier has personal favorites. The list that follows are popular varieties chosen on the basis of good plant habit for patio gardens.

CLIMBERS

'Hi Ho' is an upright grower. The coral-red, well formed flowers are borne on new wood. Can grow to 10 to 12 feet.

'Climbing Jackie' is ivory white in hot weather and distinctly yellow when it's cool. Blooms somewhat on new wood but is much more prolific after the first year. This one can spread along a fence six to eight feet in either direction, when established.

TALL BUSHES

'Dreamglo' is an upright bushy red and white bi-color. Vigorous and very pretty.

'Magic Carrousel' is a compact bushy red and white bi-color. Like 'Dreamglo', it is vigorous and pretty but with fewer petals and more substance.

'Peaches 'n Cream' is a very vigorous light cream-with-pink blend of exceptionally fine hybrid tea like form.

'Petite Folie' is a vigorous upright bushy plant with coral orange blooms.

'Red Flush' is a very compact, bushy plant with medium to light red very double flowers. An abundance of both foliage and bloom. Perhaps the best habit of growth for container growing.

'Rise 'n Shine' produces brilliant clear yellow flowers on a hardy disease-proof plant; the best yellow.

MEDIUM SIZED BUSHES

'Baby Katie' produces profuse, soft pink and yellow blooms in sprays. Color deepens and becomes flushed with salmon as the bloom ages.

'Baby Betsy McCall' has beautifully formed light pink flowers covering a compact, bushy plant.

'Baby Darling' has coral flushed apricot flowers in profusion. It can be grown with somewhat less light than most varieties.

'Cuddles' is a compact, bushy, disease resistant plant covered with beautifully formed coral pink flowers.

'My Valentine' is a very vigorous, well branched, thorny plant with informal dark red flowers in profusion.

'Popcorn' has clouds of tiny white flowers in large sprays. It is a vigorous and compact bush.

'Zinger' has single flowers of bright crimson with a gleaming yellow center; it is very bright and profuse.

SMALLER BUSHES

'Gold Coin' has buttercup yellow flowers on a compact bushy plant.

'Lavender Lace' has well formed lavender lilac blooms. The plant can be a bit slow to get started but when it is established, it's a charmer.

'Little Linda' is very profuse with light yellow blooms that lighten still more as they age.

MICRO-MINIS

'Cinderella' has perfectly formed light pink flowers.

'Red Imp' has nice dark red, tiny flowers on a micro-mini plant.

FOR HANGING BASKETS

'Red Cascade' is a prostrate climber for very large baskets. Canes can reach three to five feet. It will cascade.

'Green Ice' is really a spreading bush that has so many blooms that the weight makes the canes hang down. Apricot buds open white and fade to green.

'Memory Lane' is another spreading bush whose canes are weighted down by the mass of flowers. ⁂

Tillotson's Roses

'Duchesse de Brabant' tea rose

Do you remember the . . .

ROSES OF YESTERDAY

Patricia Stemler Wiley

Modern man is showing an interest in the revival of period homes, furniture and gardens. Not surprisingly, the old and rare roses again are coming into their own as specimen plants and background shrubs in period gardens as well as modern ones. Old roses can be bought for almost any period, whether it be Roman, Victorian or even for a specific year.

The old and rare roses should be in every garden for their value in landscaping. There is an old rose for each situation. A humdrum garden can turn into a fairyland of color and form with the addition of a few of the old roses. All their beauty, however, is not in the flowers. Delicately patterned foliage, good autumn colors in many instances, grayish tones to form color backgrounds—all can be found in these roses. There are those that produce great masses of spring bloom followed by brightly-colored hips for fall bouquets, or roses that bloom repeatedly and as consistently as any modern hybrid tea or floribunda. There are shapes, colors and fragrances unknown in today's roses.

Among the spring-blooming old roses are damasks, albas, centifolias, gallicas, mosses and species. Hybrids of some of the old roses repeat their bloom, as do the autumn damasks. Roses that flower again in the same year may be pruned at any time, including winter, just as you do with the hybrid teas and other types of modern roses. The varieties that bloom but once a year, however, should not be pruned until *after they bloom* in the spring. Since they flower on old wood, pruning in winter or early spring simply removes the potential bloom. It is good to remember, no matter when you are pruning, that the beauty of the old roses is in large, well established plants, not in severely pruned, tight little bushes.

Roses have been associated with mankind longer than there has been written history. Reference to them can be found in the most ancient of writings—and even in cave paintings. The form, color and fragrance of roses reflect the taste of the era in which they had their greatest popularity. Old roses have survived through the centuries because they are tough and durable and, depending upon their country of origin, winter hardy. Roses found in the subtropics of China, for instance, are not generally as hardy as those found in other parts of Asia and in Europe and similar colder areas of the world.

Rugosas, Gallicas, Albas

Now found world-wide are the rugosas, a type of rose from China and Japan that has adapted itself to many climates and is especially associated with beach areas. All the rugosas are extremely hardy and are distinguished by heavy, deeply ribbed foliage, much like mint leaves, that encircles the flowers on short stems. The flowers are large, intensely fragrant and, when their petals fall, hips (fruits) form that ripen to look like cherry tomatoes. Very high in vitamin C, the rugosa hips are harvested and processed for food and health teas in many parts of the world.

The rugosa roses are valuable for close plantings to mold the landscape and may be pruned and trimmed like a hedgerow. Some attain a height of four feet or more; others are lower growing. The flower colors range from white through mauve pinks to reds.

All the roses known in Europe until the eighteenth century have *Rosa gallica* as a common ancestor and, except for the autumn damasks, flower but once a year. The gallicas, as well as their descendants, have a rich, heavy fragrance and are valued for their perfume as well as their garden beauty. Known as the "mad" gallicas for their floral colorings of deepest purple to mauve pinks and reds, with palest gray apparent on the reverse of the petals of some varieties, they add depth of color in the garden, and are astounding in their quantity of spring blooms. One such gallica is 'Charles de Mills', whose blossoms show all the tones described above. Well-established plants arch over

'Maiden's Blush', a classic alba, has exceptionally nice gray-green foliage.

All photos by author

'Jacques Cartier', an intensely-fragrant Portland.

from their own weight and are very effectively displayed either as specimen plants or in the garden background.

Albas also bloom once a year, in spring. Their flower colors are actually pale pink to white, and the flowers are pungently fragrant. The greatest attribute, however, is the gray-green foliage, which is a perfect foil for the colors of the modern garden. Most albas, including 'Maiden's Blush', make large plants and should be used to enhance the total color picture of the garden.

'La Reine Victoria', a deep rose-pink Bourbon, never loses the cupped look of the petals as it opens.

Author

'Marechal Niel', a vigorous climbing Noisette well-suited for the American South.

Other Types

Because we sometimes find a lack of adventurousness among modern gardeners, the most popular of the old-fashioned rose types tend to be those that bloom repeatedly: the Portland, Bourbon and hybrid perpetual roses, and some of the species. The Portlands are very few, having almost faded out of commerce. They are a direct descendant of the autumn damasks and have the intense fragrance of the damask roses. Among those still available are 'Jacques Cartier' and 'Comte de Chambord'. Compact growth, repeat bloom and long-lasting cut flowers make them most desirable.

The Bourbons are a fascinating group of roses. Many were used as subjects of paintings, and great-grandma used them when she painted flowers on her china dishes. 'La Reine Victoria' has deep rose pink flowers which are cupped in shape and delightfully fragrant. Many venerable specimens are seen around old homes, in cemeteries and in parks. The blooms of 'La Reine Victoria' never open to a loose, full flower but keep their cupped shape until the petals fall.

In the days of Empress Josephine, the roses of fashion were those that were full with many intensely fragrant petals, just right to cup in one's hand. Empress Josephine had bad teeth, and always carried a rose in her hand, often sniffing its perfume, a graceful gesture which hid her problem. Her gardens at Malmaison, in France, gave the world many of the old roses it has today.

In touching upon the world of old roses, we should not forget the old teas, chinas and noisettes. They are tender, and should be grown only in a warm climate or, if in a cold one, by an experienced gardener who has a greenhouse or is willing to lose plants in experimentation. The most famous tea rose in America is 'Duchesse de Brabant', Theodore Roosevelt's favorite rose. 'Marechal Niel', a climbing noisette, is renowned in the South because of its rich fragrance and ability to grow up tall trees where it virtually drips with bloom.

It is with a sense of adventure that one should enter the world of old and rare roses. You will find in that world an ever-interesting and changing pattern of color and form, unsurpassed in the plant kingdom. ❧

"I know a bank where the wild thyme grows,
Where oxlips and the nodding violet grow;
Quite over-canopied with luscious woodbine,
With sweet musk roses, and with eglantine."
—A MIDSUMMER NIGHT'S DREAM

A few easy-to-follow principles for . . .

ARRANGING ROSES

Herbert E. Mitchell

Roses don't need to be arranged. They only need to be enjoyed! The magnificent form and color of the rose make it one of the few flowers that conveys unquestioned beauty whether the composition is a single blossom or an array of brilliant color.

There are only three things you need to know about arranging roses: 1. How to care for them after they are cut. 2. Easy-to-use containers and arrangement aids. 3. A few basic floral designs that are applicable to roses.

"Post-harvest care and handling," as it is professionally identified, is everything you do from the time you cut a rose until it is placed "arranged" in some special spot to be enjoyed. So the moment you cut an emerging rose blossom, you must take off your "gardener's hat" and put on your "care and handling" hat. The manner in which you care for a rose after it has been cut determines whether or not the bud will open fully, how long it will last and how soon the color will begin to fade.

When cutting a rose, place it in a receptacle of water as quickly as possible. If you are cutting several roses, it is a good idea to carry a container with warm water and submerge the stem in the water immediately after cutting. There are many old wives' tales about what to use to cut a rose and how to cut a stem. Use anything sharp—a knife, a pair of flower snips or pruning shears. The stem does not need to be cut at an angle. Just give it a clean, sharp cut and submerge it in water.

Make sure any containers you use to hold your rose "arrangements" are absolutely clean. Bacteria in containers are a primary cause of flower deterioration. Bacteria form quickly and are sometimes difficult to get rid of. Wash containers with warm detergent water. Use a bleach. Rinse with very hot water. If there are signs of any residue in a container, soak it in hot detergent-bleach water and use a brush to remove. Cleanliness is an absolute must in the care and handling of roses.

Use a flower preservative; roses respond very well to it. Generally, roses in a preservative solution last longer and hold their color longer than roses in plain water. The purity of your water is important too, the ideal combination being distilled water and a flower preservative. Water temperature is another factor. The warmer the preservative solution—90°F to 110°F is best—the quicker the rose stems start absorbing.

Make sure you remove all foliage that will be below the preservative solution in the container in which you arrange your roses. Foliage under water is a main source of damaging bacteria. In fact, bacteria begin to grow almost immediately after foliage is submerged in water. As you remove the foliage and perhaps the thorns from the stem, be careful not to damage the outside layer of stem tissue.

It might sound like a lot of work to arrange roses, but it takes many hours of loving care to grow a beautiful rose blossom, so taking the necessary care and handling precautions means that your investment in growing a lovely flower will pay off with maximum enjoyment.

Ways to Arrange

There are four ways you can arrange roses. The natural way is to simply drop a blossom or a few blossoms into a tapered-neck container that will hold them in place. A bud vase, a wine decanter, a bottle or any spotlessly clean flower vase which has a pinched neck and fluted top make excellent containers for roses. Fill the container with warm preservative solution, remove all foliage from the part of the rose stem that will be under water, give the stem a fresh, clean cut and place it in the container. If you are using more than one stem, let each flower find a natural placement. Don't try to arrange or contrive, let it look natural; it's a great way to enjoy roses. Rather than placing one big bouquet in a single room, use a blossom or two in the rooms you use the most! And don't forget the bathroom; being greeted by a gorgeous opening rose blossom is a fine way to start any day.

If you like to use cylinder type containers you might have some difficulty making the roses stay in place. Cut a piece of chicken wire or hardware cloth about twice the width or diameter of the container. Roll it into a loose ball. Then use florist or adhesive tape crisscrossed through the chicken wire to attach it to the top of the vase. If the chicken wire shows after you have finished your arrangement, use a few pieces of shrub foliage in the arrangement to cover the wire.

Pinholders are still a favorite flower holder for many flower arrangers. They are especially convenient for shallow containers or line arrangements. Contrary to many opinions, roses do not need to be in deep water to survive. An inch is ample as long as the level is kept constant and not permitted to evaporate. Place a heavy pinholder in a container, or anchor it in with clay. Trim the rose stem square and then place firmly on pinholder. When you have finished arranging the roses, add a

Arrangement: Muriel Jaffe. Photo: Bill Sevecke.

Roses, carnations and snapdragons in a right angle arrangement. Note how the container complements the shape of the design.

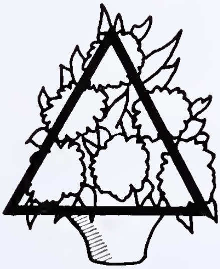
few stems of greenery, then cover the base of the pinholder with stones.

The most popular arrangement aid is one of the floral foams. Foam is the best base to use when you want to make a centerpiece or a flower arrangement which takes on a definite shape such as a symmetrical or asymmetrical vertical composition. Before using flower arranging foam, saturate it thoroughly in warm preservative solution. Anchor it in a container by using tape across the top. Make sure you provide enough room in the container for adding water. Do not pack a container solid with saturated floral foam because your roses will not survive. Roses need more water than a foam can provide unless there is room in the container for a constant supply of water. After you have enjoyed your rose arrangement, remove the flowers and discard the foam. Do not reuse floral foam; very often it will not completely absorb water the second time around. This causes roses to bend their necks and wither.

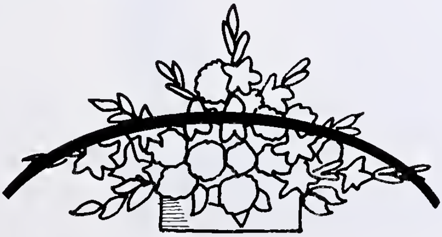
Basic Shapes

If you want to give a professional flair to rose arrangements, you might want to follow one of the following basic shapes. In all cases, you will probably want to use saturated flower foam in the container. Floral foam holds each stem precisely where you place it.

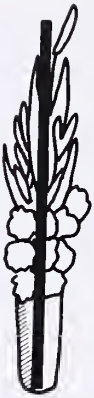
The Equilateral Triangle: One of the most popular basic forms for floral arrangements. Technically, an equilateral triangle has sides of equal length. As illustrated in the diagram, the horizontal base line of the design and the vertical height of the arrangement are equal. In constructing an equilateral arrangement, first establish the height, then the width. These two dimensions must be approximately the same length. Fill in the arrangement within the triangular form.



The Horizontal: Normally used for centerpieces. Technically, a horizontal is any shape where the total length is greater than the height. When arranging roses in a horizontal for a centerpiece, keep the height low and comfortable for conversation at the table. For coffee-table or credenza arrangements, exaggerate the height slightly. When arranging a horizontal, keep in mind how the bouquet will be used. Often people will look down into the design, therefore depth is important. To achieve a strong third dimension, bury some rose blossoms deep in the arrangement and place others throughout at varying levels.

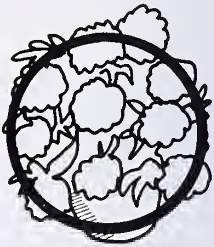


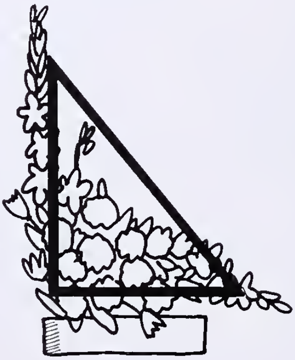
Drawings by author



The Vertical: The perpendicular line arrangement is an excellent choice for a few rose blossoms, especially if some of the flowers are more open than others. Five or seven roses with added foliage make an outstanding vertical line design. When constructing a perpendicular, first establish the height, then add remaining flowers, keeping the vertical line tall and thin. Ideally, the width should be no greater than the width of the opening of the container.

The Circle: As a natural art form, the circle is one of the most pleasing. The "roundish" bouquet is interpreted in many ways. The "Continental," "European" and "Tussie Mussie" are some of the more popular names. The shape of the circular design is informal, but it is often difficult to construct. First establish the outside edges of the circular pattern, then fill in the shape. If you decide on a circular design, you'll want to use roses in various stages of bloom opening.





The Right Angle: When constructed properly, the right angle highlights each blossom and provides the best showing for the number of flowers used. It is quite popular for modern rose arrangements. As illustrated, the height of a right-angle design should be greater than the width. The most popular, and perhaps most pleasing, right-angle arrangement flows from high left to low right. First, establish and place the height of your right-angle design at the far left of the container, then determine width. Fill in with rose blooms to create a slightly "sculptured" look as flowers are placed to connect the height with the base line.

The most important thing about arranging roses is to enjoy what you are doing. If flower arrangement is not your thing, don't worry. Simply slip some blossoms in a vase and enjoy them for what they are. If you have a flair for design, then have fun arranging your roses. The best thing about roses is that they can be enjoyed no matter how simple or elaborate the arrangement. ⁂

Raising the standards by . . .

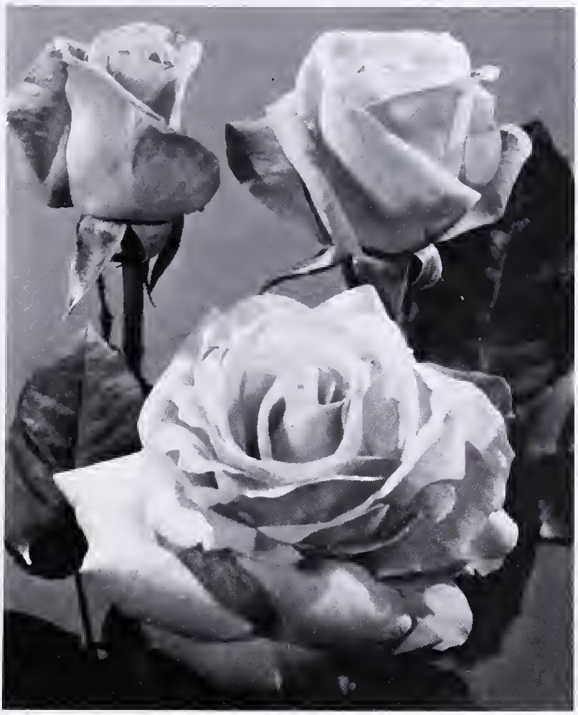
EXHIBITING IN SHOWS

Frank A. Benardella

Exhibiting roses can be an interesting extension of your gardening hobby. The American Rose Society sponsors approximately three hundred fifty rose shows each year and most of the thirty thousand local garden clubs have sections in their shows where roses can be exhibited.

The exhibition rose (hybrid tea) by American standards should be large with abundant petalage. The petals should be symmetrically arranged with a high center. At the time of judging, the ideal bloom should be from one-half to three-fourths open. It should have good color, typical of the variety, with lots of substance. It should be clean and unmarred by moisture or spray residue. The stem and foliage must be in proportion to the bloom size. Since good foliage sets off the beauty of the bloom, it should be clean and disease-free.

To have exhibition roses one must start with varieties that can produce the type of blooms that meet the above criteria. Not all are capable of producing winners. A recent survey lists the following as being the top ten exhibition roses in the United States: 'First Prize', 'Royal Highness', 'Garden Party', 'Granada', 'Peace', 'Pascali', 'Swarthmore', 'Toro', 'Mister Lincoln', and 'White Masterpiece'. Interestingly, seven of the top ten roses are also All-America Rose Selections winners—proving that exhibition varieties can also be very good garden varieties, giving lots of color in the garden



All-America Rose Selections

Three stages in the opening of a rose: bud, one-third and three-quarters. This is 'Sundowner', an award-winning grandiflora.

Conard-Pile Co.

A rose of exhibition quality, a full three-quarters open, with a bud.

and exhibition blooms at show time. Not all perform well in all parts of the country, so check with a local American Rose Society Consulting Rosarian to see which are the best for your area.

Most exhibitors plant at least three bushes of a variety, thereby insuring bloom at show time. Planting is important to an exhibitor. Full sun is preferred and the beds are usually prepared to a depth of thirty inches, with liberal amounts of organic matter incorporated.

When the plants first leaf out in spring, a spray program to prevent insects and disease is started. Weekly applications of insecticide and fungicide keep the foliage clean and healthy. The spray program is kept up until approximately ten days prior to the show. In this way the plants are healthy, and when the blooms are cut they are clean and free from spray residue.

Fertilizing varies from exhibitor to exhibitor, but heavy feeding is the norm. Most start in early spring at the time of pruning with a cup of dry fertilizer such as 5-10-5 organic, spread around each plant. Thereafter, the plants are given a dry feeding monthly with supplements of a liquid fertilizer every two weeks in between.

The key to exhibition roses is water, for without it all the fertilizer in the world won't help the plants grow. From early spring through the growing season the plants are continually watered. Deep watering is important—a sprinkle does more harm than good. The week before the show the roses are watered almost every day. This is what gives the blooms substance, which is firmness and crispness in the petals. When roses lack water, the blooms lose color and the petals appear soft and very often droop, affecting the form.

While the roses are growing, exhibitors practice the ritual of disbudding. This is the removal of the side buds, leaving only one flower per stem. The side buds are removed so that all the energy goes into producing one very large bloom. The earlier the side buds are removed, the better. If they are removed late, telltale scars will detract from the overall beauty of the bloom.

When the roses start to come into bloom many exhibitors protect yellow and light-colored blooms from the hot rays of the sun with some sort of shade. All types of homemade "bonnets" are put over the blooms to prevent the fading of delicate varieties. Color is very important on the show table and bloom that has clarity of color will stand out against one that has been bleached by the sun.

Most rose books tell us that the best time to cut a bloom is late afternoon when the sugar content is highest. However, an exhibitor cuts his blooms when he feels they're ready to be cut, regardless of time. Usually this time is between six and ten in the morning. Once the bloom is cut, it is immediately placed in water and taken indoors where it is partially groomed. Nothing is done to the bloom at this point, but the stem and foliage are cleaned, removing all traces of spray residue. The foliage can be cleaned by rubbing it with a soft cloth moistened with a mild solution of detergent and water. No oil or other foreign matter is permitted.

When the roses have been cleaned, they are placed in a refrigerator for hardening off and storage prior to the show. Roses can be refrigerated for almost a week; however, after three or four days, they begin to deteriorate. The temperature of the refrigerator should be set as close to 33°F as possible, care being taken not to freeze the blooms. Many people use paper cones around the stems during storage. These can be fashioned from freezer paper eighteen inches long. The paper is cut fifteen inches at the top and four inches at the bottom. Gluing the sides makes the cone.

Modern frost-free refrigerators tend to dry out the blooms, causing loss of substance. An old-style refrigerator is preferred. If you must use a frost-free one, place waxed paper bags over the blooms, holding them on with Twistems at the base of the bloom. If you have an old-style refrigerator, it is not necessary to cover the blooms, but the humidity should be kept high. If you add a floral preservative to the water you store your roses in, you need not re-cut the stems while in storage.

Many exhibitors keep an inventory of the blooms they cut so that they know exactly what they have to work with the day of the show. Today's rose show schedules are very complex and one should read them carefully before leaving for the show. You should have an idea what classes you wish to enter, utilizing all the roses that you cut and stored.

If the show is a short distance away, elaborate transportation methods are not necessary. Simply fill a bucket one-quarter full with cold water and place your blooms in it. Put a large bag over the entire bucket, being careful not to let the bag touch the top of the flowers. The bag is used to protect the blooms from the direct rays of the sun.

Arrive at the show early, for there is much to be done. First, find a spot in the preparation room that will be out of the main flow of traffic. It should also be well lit and free from drafts. Once you have your set-up area, obtain vases and entry tags from the show committee. Be sure the vases are filled to the top. All too often people either forget to put water in the vases or don't fill them full enough. Make a fresh half-inch cut on all stems before putting them in the vases.

It's now time to start the final grooming. Recheck the foliage and stem first, making sure the foliage is very clean. Remember that the rules say you can't add anything. If one leaf is badly damaged or unattractive, simply remove it. If you have a torn outer petal on a bloom, or if some of the outside petals on your red rose have white streaks in them, remove them. Work on the bloom in an attempt to arrange all the petals symmetrically around the high center. If the bloom looks lopsided (open more on one side than the other) use a Q-tip to open the tight side of the bloom, to correspond with the other side. The judges will be looking for perfect form typical of the variety.

Once the final grooming is done, put a properly-filled-out entry tag on your exhibit. Some shows have placement committees, while others allow exhibitors to place their own entries. If you place your own on the table, be careful not to damage other entries. When you place your own entries you have an opportunity to observe your competition first hand. If your entry is a lot taller than the rest of the entries in the class, cut the stem to bring it down to about a half-inch above the rest. If your entry is shorter than the rest, prop it up in the vase by wedging something between the stem and vase. Do everything you can to make your entry look its best for the judge.

Exhibiting, like anything else, takes time to master. Very few people are successful on the first try, so if you win a ribbon at your first show you will probably be hooked and begin anxiously waiting for the next show to enter . . . and the next . . . and the next . . . ✿

Eva Melady

A membership organization for enthusiasts . . .

THE AMERICAN ROSE SOCIETY

Harold S. Goldstein

What is the American Rose Society and what purpose does it serve? The ARS was organized in 1899 to promote rose growing and to distribute cultural information on rose care. Last century's rose growers wanted more people to become involved in rose growing, but they could not possibly envision how much ARS would grow or the multitude of services in which it would become involved. The original officers, headquartered in Harrisburg, Pennsylvania, realized that a more complex organization for ARS was needed. Soon a publication evolved to help distribute rose information.

Rose societies in other cities sprang up; these societies affiliated themselves with the national organization, ARS. This trend continues and, today, there are over three hundred sixty local rose societies affiliated with ARS. Each rose society averages over one hundred members.

The American Rose Society, with its strong national membership, is among the most active plant societies in the United States, offering help, encouragement, information and social activities to its many members. Today, ARS is headquartered on one hundred eighteen acres of piney woods on the outskirts of Shreveport, Louisiana, where nearly ten thousand roses bloom annually in over thirty-five gardens. Funding for the gardens came from business firms, rose societies and individual ARS members throughout the United States. Visiting the ARS gardens is an educational experience where you see how many different ways roses can be used in landscaping, both on a grand and a small scale.

An additional treat, to be viewed at the American Rose Center, is the Hybridizer's Test Garden; in this garden are grown the newest creations from rose hybridizers nationwide, including hybrid teas, floribundas, grandifloras and climbers. The roses entered in the Test Garden are judged for two years and awards are given to first, second and third place roses. One day the roses tested in the Test Garden may be introduced into commerce.

Furthermore, ARS has set up five different test gardens, located throughout the United States. One is located at the American Rose Center, where only miniature roses are grown and evaluated. The roses are entered by American hybridizers who feel that they have created a very special seedling, perhaps one worthy of commercial introduction. Miniature roses that are tested in the ARS Miniature Rose Trial Grounds and those deemed especially worthy are given the American Rose Society "E" for Excellence Award. The ARS Miniature Trial Grounds are the very first, worldwide, for the exclusive judging of miniature roses.

American Rose Society members also contribute funds which are channeled into research programs conducted by the United States Department of Agriculture, Iowa State University, Texas A & M, Ohio State University and Oregon State, just to name a few centers of research. Topics of study include winter hardiness, rootstock, fragrance, crown-gall tumors and black-spot control. Research information, funded by ARS, is published in the *American Rose Magazine*, the *American Rose Annual* and various horticultural publications nationwide.

The *American Rose Magazine*, a thirty-two-page monthly color magazine, helps people grow better roses and keeps members in touch with rose society functions. The *American Rose Annual* averages two hundred fifteen pages and contains articles by some of the finest growers worldwide.

ARS, through its system of eighteen districts, has a program called Consulting Rosarians. Consulting Rosarians are individuals appointed by their District Director for the purpose of helping fellow rose lovers to grow better roses. A person need not be an ARS member to take advantage of these experts; one need only write to ARS headquarters. ARS will then notify a Consulting Rosarian in the appropriate area that you desire a conference or even a garden consultation.

ARS has a program by which Rose Show Judges are trained, tested and accredited. These judges must go through a training period that includes many opportunities to judge as an apprentice before actual accreditation. Once accredited, Rose Show Judges must attend periodic refresher seminars to maintain their status as active Accredited Judges.

Members of ARS are periodically surveyed to see how they rate the overall growing habits of particular roses. The information is compiled and published as the *Handbook for Selecting Roses*. Roses currently in commerce are rated numerically so that an interested buyer can obtain the best ones with the least expensive experimentation. The *Handbook for Selecting Roses* is available from ARS headquarters for twenty-five cents plus a self-addressed stamped envelope. Also, many nurseries purchase the handbook in bulk to distribute to their rose customers.

ARS also helps nurseries to sell their roses through marketing techniques. Local rose societies often volunteer to help rose consumers learn basic planting and horticultural practices. This advice helps the new rosarian gain years of gratification from his initial investment.

To help local rose societies maintain the interest and involvement of their members, ARS operates an extensive Lending Library and offers a wide assortment of films and slide programs. These programs help local societies present programs which are informative and educational. Also, special certificates and ribbons are available to local rose societies to use in conjunction with their rose shows and for special recognition of outstanding members.

Twice a year, the national ARS headquarters, in cooperation with a local rose society, stages a National Convention at which outstanding rosarians give programs on rose culture, hybridizing, disease control and other subject matter which is of interest to all rose growers. The exchange of ideas is an important part of rose growing.

To bring order to the vast world of roses, ARS acts as the International Registrar of Roses, registering and maintaining a permanent record of roses in commerce throughout the world. This registration system has been heralded as perhaps the finest of any floral group and has served as a model for other plant societies in their record keeping.

Overall, the American Rose Society is a great place to meet people who share your love for roses, and a great place to share information to improve rose growing. In addition, it's a great place to make friends, for ARS members are, perhaps, the greatest group in the world! Membership information may be obtained by writing to ARS headquarters, P.O. Box 30,000, Shreveport, Louisiana 71130. ✿

Over forty years of national testing . . .

THE ALL-AMERICA ROSE SELECTIONS

George E. Rose

All-America Rose Selections, now entering its forty-first year of public service, carries on with its program practically unchanged, controlled by carefully worded By-Laws and Rules and Regulations, much the same as those first written in 1939. The sole function of this non-profit research corporation is to carefully test the new rose hybrids entered into trials and determine which, if any, are worthy of recommendation to the buying public as being among the best roses that are to be had.

Over the years, more than two thousand new rose hybrids from all over the world have passed through two years of rigorous testing in AARS gardens. Of that number, only 109, or about 5.4 percent of those entered, have been found worthy of an All-America award. This indicates that AARS is functioning as it was intended to. The 1,891 entries that did not quite measure up to AARS standards have, for the most part, been kept from cluttering up the market with inferior rose varieties, to the benefit of the buying public.

This does not mean that all of the best roses are AARS award winners, nor that all AARS award winners have proven in the long run to be the best roses, but by-and-large they have consistently given satisfaction and remain the favorites of gardeners everywhere.

Maintaining a small but very active headquarters office in Shenandoah, Iowa, the AARS organization, composed of the nation's largest rose producers and hybridizers, has twenty-five official test gardens strategically located throughout the United States. These gardens are chosen to include, as far as possible, all of the soil and climatic conditions in the areas in which roses are commonly grown. The test garden locations and the official judges are chosen with great care, always with a predominance of non-member gardens and judges, to guard against any possibility of favoritism for the new introductions of member firms. In addition, member-firm judges, of which there are six out of the total of twenty-five, are not allowed to score roses entered by their companies. The nineteen non-member test gardens are located at universities or large public gardens staffed by trained horticulturists.

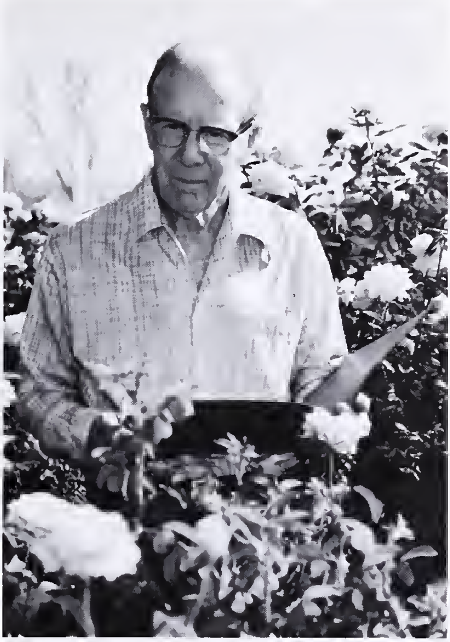
How Judges Score

During the two-year trial period that each rose entry must undergo, the judges are required to submit four sets of scores. Each judge must examine and score the entries for his own records as many times as possible throughout the two growing seasons. His first official spring scores must be submitted to the Secretary's office by July 1st, and his first official fall scores by November 1st. His second-year scores are submitted in the same manner, with his written comments regarding the entries included with his final two-year fall scores.

Each of the four official sets of scores is computed at the headquarters office and the results sent to all AARS members and judges to keep them informed of the progress of the entries. The computations of the two-year final scores, together with the judges' comments, are mailed to the membership at least a month before the January meeting at which the voting for award winners takes place.

According to the *Judges' Guidebook*, which is the bible of the AARS judges, there are fourteen categories on which scores for each entry are to be submitted. They are: novelty, bud form, flower form,

J. Awdry Armstrong, a founder of AARS, here in one of their test gardens. He is, in terms of length of service, the oldest official judge.



All-America Rose Selections

color opening, color finishing, substance, fragrance, stem/cluster, habit, vigor/renewal, foliage, disease resistance, flowering effect and overall value.

All categories carry an equal value in that each may be scored as poor, fair, good, very good or excellent. Scoring factors of four, six, seven, eight and ten are attached to these evaluations. The values the judges apportion to the fourteen categories are then added and, by a conversion table, are converted into a numercial final score that the Secretary's office of AARS uses in computing the standing of the various entries. In order to give the judges more latitude in expressing their personal opinions of the entries gained from constantly appraising them over the period of two years, two categories (novelty and overall value) are included.

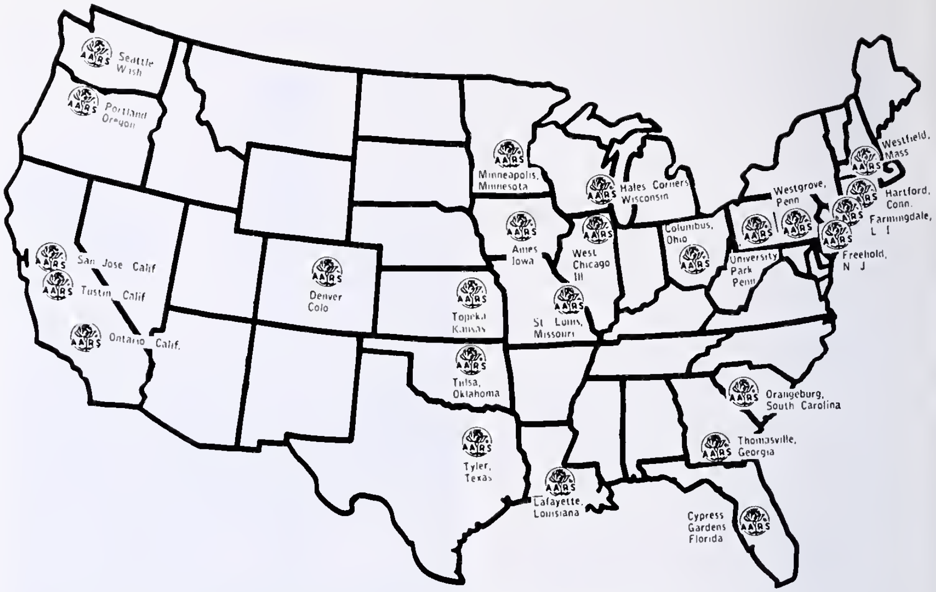
The category "novelty" may be regarded as an expression by the judge of his first impression of the entry. Quoting from the *Judges' Guidebook*: "Does it make your heart throb, or does it put you to sleep? Do you remember it in your garden, or do you have to take another look to see what was there? We want you to express this observation purposefully under novelty."

The second category is "overall value," the last category on the list. To quote again from the *Guidebook*: "Now, taking all the factors into consideration, would you plant this rose in your own garden, or recommend it to your best friend? That's really what it's all about, isn't it?"

At the January session of the membership, the two-year entry first considered for an award is the one that has received the highest score of all the two-year entries, regardless of class. The voting is carried out by secret ballot. After the ballots have been counted, the President announces whether or not the entry has been voted an award, and the action moves on to be repeated for the next highest two-year entry, provided it is of a different classification from the first one. The third entry to be voted upon is the highest scorer in the third classification, and so on, through the five classes of roses recognized by the Rules and Regulations of AARS. The cycle is repeated until the voting is closed.

The Rules and Regulations provide that there shall be a maximum limit of five varieties receiving awards in any one year. In 1951, however, no entry was considered worthy of an award, and none was given. In 1970, only one entry, which was introduced as 'First Prize', received an award. In the past forty years the average number of annual awards has been two and one half.

Entry into the AARS trials is open to any new variety from anywhere in the world that has not been offered for sale as a garden rose in this country. There is no limit to the number of roses an individual may enter, except that the entry fee increases as the quantity of entries increases. The only restriction imposed is the requirement that the entrant must be able to supply a sufficient amount of



The locations of the twenty-five AARS Official Test Gardens are determined by population density and suitable climate.

propagating stock should his entry win an award. The premise is that there would be no point in conferring an award on an outstanding rose that could not be supplied in sufficient quantity to make it available to the public within a reasonable time.

Promotion and Display

The AARS testing program would be of no value without sufficient communication to keep the public informed of the new award winners. The winners for a given year are announced in early June of the preceding year. At this time no plants are available, nor will there be any until they appear in some fall rose mail order catalogs, with general sales following the next spring.

While this procedure may seem to be complicated, it is really not as poorly conceived as it appears. Secure in the knowledge that All-America Award winners are the outstanding roses of the country, AARS has always planned to give interested gardeners an opportunity to see each year's new award winners long before they are obtainable from any source. To make this possible, over one hundred of the largest and best public rose gardens in the country have been set up in an AARS accredited public rose garden program.

Each spring these gardens are sent a sufficient quantity of plants of the new award winners to fill an average-size bed. There is no charge to the garden for the plants which are sent under AARS number only. In June, green and white metal bed markers bearing the names of the winners are sent to the gardens and the public is invited to visit them and to see and judge the new roses for themselves. These roses will then go on sale the following fall and spring.

To keep the public advised of the new award winners, news releases describing and picturing the roses, together with information regarding the hybridizers and other pertinent facts are sent to thirteen thousand daily and weekly newspapers, selected TV stations, agricultural county agents interested in ornamental horticulture and all periodicals that would be interested in presenting the roses. These releases are accepted by the press as news and thus the service to the public for which AARS came into being completes its cycle.

For those who would like a special challenge . . .

THE PLEASURES AND FRUSTRATIONS OF BREEDING ROSES

J. Benjamin Williams

So you're going to hybridize roses. Good! If you're like most amateur rose breeders, you'll be very vocal and quick to say that you hybridize only for pleasure and are not interested in marketing your creations. Deep down inside, I'll bet you'll dream, hope and pray for a beautiful, new, award-winning rose. Why not? It is this dream that motivates most breeders, amateur and professional alike.

Being an independent rose breeder not connected with any specific nursery has given me the opportunity to see and experience both the pleasures and the frustrations of hybridizing. Success and failure are daily occurrences for any plant breeder; if you can learn to handle the latter as well as the former, you've got it made!

How It Began for Me

My interest in rose breeding began while working in Europe after World War II, and in 1953, after much study and research, I started a breeding program. For twenty years I ate, drank and slept roses, traveled to every rose show, visited gardens and growers and read everything I could find in print. A half million crosses later, after producing and sowing some two hundred thousand seeds, I narrowed my forty-eight thousand seedlings down to two hundred fifty promising plants. Of these, fifteen have been named and registered, and ten are available for sale in this country. The most exciting moment in my rose breeding career came on a cold and snowy Sunday afternoon in January 1974 when I heard by telephone that my rose 71R75, later to be named 'Rose Parade', had won the All-America Rose Selection Award.

As a breeder and hybridizer, I know first-hand the exhilaration of playing a part in creating something new and beautiful. Creating a new rose is making a dream come true. Just to see the glistening beauty of a well-formed bud of your own plant or smell the haunting fragrance of a stately open bloom gives pleasure enough to keep one's heart young and pride enough to pop the buttons on any vest.

Rose breeding is also the people, the warmth, the friendship, the opportunity to associate with the best hybridizers in the world. It's the medium for the exchange of ideas in an area of pleasure which is not overcrowded and where the opportunity for research and new discovery is always at hand.

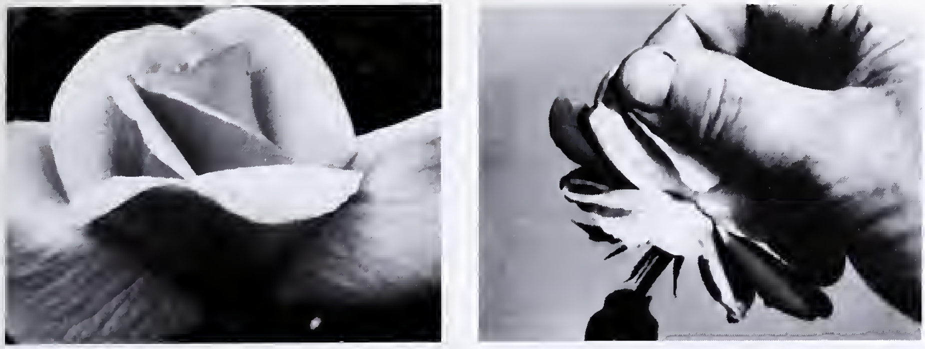
Expect Some Disappointments . . .

Even if you never market or plan to market your creations, you will still encounter many of the routine frustrations known to the professional hybridizer. Perhaps your seed parent will not produce hips, for not all roses are good "mothers." If "she" does produce seed, there is no guarantee that the seed will germinate. There is little, if any, statistical information on rose seed germination, and what is available varies from rose to rose and breeder to breeder. However, you can expect anywhere from 0-40 percent germination. Consider yourself lucky if you achieve twenty-five percent success.

Herman Gantner

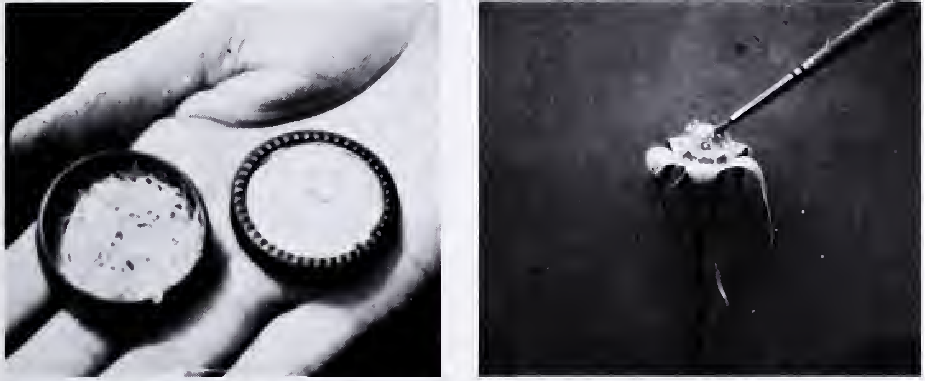
The originator of the 'Peace' rose, the late Francis Meilland, shown in his greenhouse in Antibes, France.

Left, J.B. Williams & Assocs. Right, Jackson & Perkins Co.



Left, a rose at the proper stage of development for collecting pollen and for pollinating. Right, petals are gently removed.

Left, Jackson & Perkins Co. Right, J.B. Williams & Assocs.



Left, pollen is collected and stored. Right, dried pollen from one variety is used to pollinate the stigma of another variety.

Most professional breeders today sow their seeds directly into a greenhouse bench in specially prepared sterile media where the seeds are germinated, evaluated and finally budded out or discarded. The seedlings are never transplanted. If your greenhouse space is limited or nonexistent, you will have to transplant your new roses outdoors when weather permits, and in doing so you may be faced with the disappointment of losses due to disease, climate or unwanted visitors.

. . . and Rewards

Before long you'll feel excitement as your new plant grows and thrill as the first bud forms and opens. You'll be witnessing something no other person has ever seen. But what if the flower has too few petals, is malformed, has vegetative growth in the center, or is of poor or unstable color? What if the blooms are dull, if they blue as they age, if they burn in the sun? What if the plant is overly susceptible to disease? In all honesty, the plant should be discarded, but you should try again.

The most beautiful seedling may appear to have all the attributes of a beautiful rose while growing on its own roots the first year or two, but this same seedling may, and often does, turn into a malformed, unattractive rose when budded onto understock to be commercially reproduced. By the same token, a mediocre-looking seedling that has good blooming and growing qualities when budded onto understock for commercial purposes may turn out to be an outstanding garden rose, even an All-America Award Winner.

J.B. Williams & Associates

The pollinated rose is enclosed in a glassine bag until the hip (left) is ripe enough to harvest seed. After cleaning and stratification the seeds are sown in sterile soil. Seedlings are moved to a growing area in the greenhouse when true leaves appear

Follow-up

The mark of a truly expert rose breeder is the ability to recognize the value of a new rose. If you think one of your seedlings has market potential, then, by all means, pursue it. Remember, though, that even the professional sometimes suffers disappointment when one of his "best" is not introduced or accepted by the buying public.

If you send your prize seedlings to a major nursery for test, you will undoubtedly receive encouraging letters for the following two years stating that your seedlings have many outstanding qualities at times but do not have enough character or novelty to justify their commercial introduction. If you can keep from becoming discouraged and still be enthusiastic about hybridizing, every letter will bring you closer to a winner.

A professional hybridizer has to sow one hundred thousand seeds each year to market one or two new roses. The seedling must not only be new, it must also be different—and better—than anything in existence. When you're dreaming of the apple of your eye becoming a star, ponder this: there are at least twenty-five or thirty professionals in the world going after the same market that you are and who are blessed with skill, patience, attention to details, a large inventory of stock plants, good facilities and an eight-hour day. On top of that, very few seedlings make enough money to pay for the photography, patent and promotional expenses. This doesn't mean that you can't derive pleasure from your seedlings, from growing and showing them to your friends, and maybe marketing a winner.

"The Game's Afoot"

Rose breeding is a challenge, like a game of skill. Imagination, enthusiasm and perseverance make the difference between pleasure and frustration, but a few basic rules must be followed. Be a good rose grower; understand plant culture and the importance of routine care. Through study and experience, learn which roses make good parents; don't waste time on roses with bad traits or growing habits. Then, be observant, be careful, be patient, and be proud of your achievements.

If you have nerves of steel and hide as tough as leather; if you can keep your eyes open, mouth shut and smile when it hurts; if you are able to walk on glass in the presence of those with whom you must do business; if you have an unlimited source of income—then you are halfway home to becoming a successful rose breeder. If you can live with the frustrations, you'll enjoy the pleasures. May God bless you in all your efforts—you may need it when you start breeding roses. ✿

How the pros do it . . .

NURSERY ROSE PRODUCTION

Fred Edmunds

The production of roses in the United States stretches back into colonial times when most of the old garden roses, as we call them today, were easily propagated from slips or cuttings. When the steam vessel replaced the schooner, roses became more popular because they could be transported in winter in the dormant state from Europe, primarily England, and planted in American gardens. When World War I broke out and cut off the supply of roses from Europe, American nurserymen had to increase their production, and many of the older rose nurseries in business today date their beginnings to this period.

Roses can be grown from cuttings, but many of our most popular garden varieties are such complex hybrids that they root poorly or erratically. Grafting, particularly bud grafting, is now the most common method of producing plants for sale. The only exception would be the miniature varieties whose limb structures are so tiny that it is very difficult to propagate by this means.

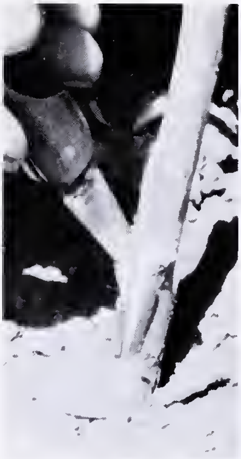
Rootstock and Scionwood

Initiating a crop of roses begins with a rootstock cutting. There are three major types of rootstocks produced in the United States. By far the greatest number of roses are grown on a climbing variety called 'Dr. Huey', which has the unique ability of being able to stand the irrigated desert soils of the Pacific Southwest. The combination of high salt content and high pH levels retards the growth of most understocks and yet 'Dr. Huey' survives very well and produces a fine plant. Varieties of multiflora rose, the second major type of rootstock, generally prefer cool, damp soils or acid soils and are used for production in the northern tier of states and in the rose-producing states bordering on the Gulf of Mexico. Multiflora rose can be grown in the arid Southwest, but it requires treatment to reduce the pH of the soil, and a lot more water. *Rosa* x *noisettiana* 'Manettii', the third type of rootstock, is primarily employed where the resultant plant is to be used for greenhouse forcing. It produces more and better blooms under forcing conditions for a longer period than other rootstock varieties.

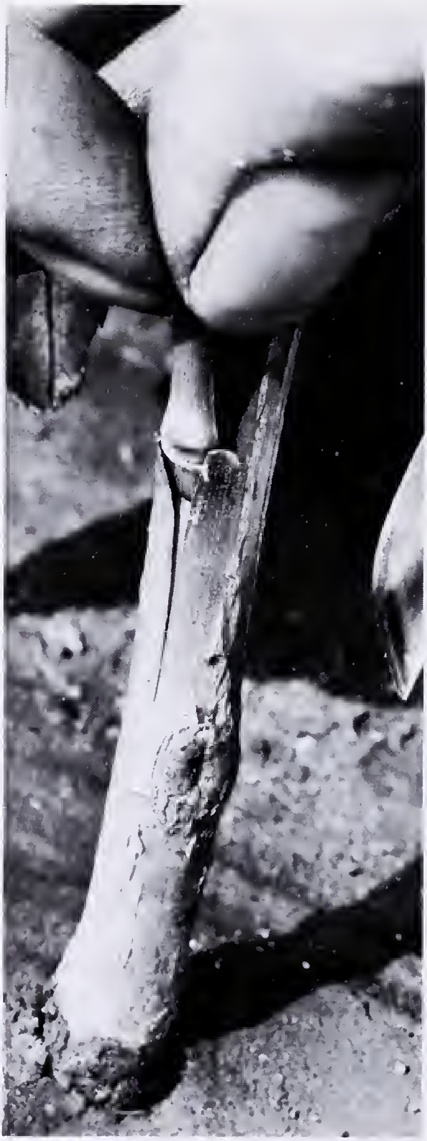
The first step in field production is proper soil preparation. To insure an even rooting, the best quality, most friable soils are employed exclusively. Most fields are fumigated prior to planting to control noxious weeds and soil-borne pests that could infest the plant during the two years of intensive cultivation. Cuttings are prepared from the rootstock selected for the area. They are generally eight to nine inches in length, selected from understock blocks grown specifically to produce cuttings from long straight stems. The lower eyes on the bottom three-quarters of the cutting are removed, usually with a knife, in a process called de-eying. This drastically reduces the ability of the plant to produce suckers. The cuttings are then planted in rows from five to nine inches apart, depending upon the total amount of sunlight available. Rows average four feet apart because this matches the equipment used to cultivate and harvest. Planting is done during the dormant season, except in the northern climates where the cuttings are planted at the end of the dormant season.

Rootstock varieties are extremely vigorous, requiring only minimal amounts of fertilizer to grow. Their needs are sunshine and copious amounts of water. Many southern California fields apply as much as one hundred inches a year to keep the plants growing well and to

Left, right: author. Center, Armstrong Nurseries



Above, a T-shaped cut is made in the understock. Right, a shield-shaped piece that includes a bud is taken from the scionwood and inserted under the flaps of the cut in the understock.



Below, a budding strip of flat rubber is used to keep the graft firmly in place. In time the rubber deteriorates and falls off, so the plant is not girdled.

offset the water loss in the arid climate.

In early summer budding begins. This is accomplished by teams of two persons—one who cuts and inserts the graft, and the other who ties it firmly in place with a flat rubber budding strip that will expand to prevent girdling as the plant increases in girth. The eyes themselves are found in the axils of most leaves, and the cutting includes the bud on a shield-shaped piece of bark with a thin sliver of the woody tissue underneath. The cut made in the understock is T-shaped, and as the transverse upper cut is made, an expert budder can slightly open the two flaps of bark to allow insertion of the bud cut from the scionwood.

Scionwood comes in two forms. In former times it was cut from the previous year's budded crop growing in the field, and only those stems of approximately pencil size that had produced a bloom that had wilted and blown were considered mature enough to be used. In more recent years it has been discovered that the best budwood is taken from dormant plants in late fall or early winter, stripped of its foliage, but not the thorns, wrapped in damp newpaper, and placed in plastic bags which are held in a cool storage facility at 31°F. Under these conditions the budwood will last six to nine months and produce a higher rate of bud take than will fresh wood. Within two weeks the budding can be inspected and, if an insufficient number are alive, the plants can be rebudded in a different place on the understock.

After budding, the plants continue to grow the rest of the season, storing sugars and starches in the root system to insure a superior plant the following year. In southern climates the buds can be left exposed, but in northern areas the grafts are covered with soil to prevent injury over winter. This covering also protects the buds from frost damage as they begin to sprout the following spring. Toward the end of the dormant season the tops of the understock are removed, leaving only the root system with its stored starches, plus the graft or bud that was inserted the previous summer.

In early spring the graft begins to grow, and often vigorously so. To prevent the primary stalk from breaking off, the top of the growing graft is cut back either manually or mechanically in a process known as pinching, which arrests growth and forces additional branches to arise from the graft. For the rest of the season the plant continues to grow and expand, requiring fertilizer, water and spray materials to insure that it will produce the best plant possible by harvest time.

How They Come to the Customer

Years ago roses were dug with a shovel, but modern techniques today employ a large, U-shaped blade that in one stroke cuts at a required depth and loosens the soil so that the plants are actually pulled out of the ground much as one would pull a carrot. The plants are graded with the No. 1's having three or more large canes; the medium, or 1½ grade, having two or more large canes; and the small, or No. 2 plants, with two or more smaller canes. The length depends upon whether it is a hybrid tea, grandiflora, floribunda or climber, but all must have an adequate root system.

After lifting, the plants are stored in either a cool, damp, refrigerated storage, or packed in hermetically sealed containers to be shipped via refrigerated truck or rail car to storage facilities located throughout the country. A temperature of 37° or less must be maintained to keep the plants completely dormant. Particular care must be taken to keep the temperature above 25° to prevent injury to the root system.

The final product can reach the customer in a variety of ways. Most mail order houses and some nurseries provide bare-root plants that are shipped in hermetically sealed envelopes, then placed in corrugated cartons, to prevent drying during shipping. Some plants are root-wrapped in a moisture-holding material and placed in colorful polyethelene bags. This allows the display of the plants at local garden centers for a long period of time with little care. Should a packaged plant be purchased that has already begun to sprout, the sprouts should be removed, the plant taken from the package and placed in a hole large enough to accommodate the roots. Plants placed in larger containers extend the planting season into late spring and early summer when bare-root dormant plants would thrive only with difficulty. Some roses can be planted container and all. Others must be removed. When purchasing a container-grown plant, it's always wise to find out if the container is biodegradable or not.

Roses are extremely popular and annually nearly forty million plants reach the market, eventually winding up in someone's garden. Because a major portion of the labor involved in rose production is the hand labor that is becoming increasingly difficult to find, production methods may change as they are changing now and have changed in decades past. To insure the continuing success of roses as our favorite garden plant, commercial producers will always seek the means to grow the best possible plant at a reasonable price.

THERAPY AND REHABILITATION WITH ROSES

Sierra Garden for the Blind

Dennis D. Thompson

On a summer afternoon in Edmonds, Washington, the clean scents of cedar and Douglas-fir mingle with the fragrance of the sweetbriar roses surrounding Sierra Park. Originally conceived as a Lion's Club project for the blind, the grounds have evolved into a retreat for both the blind and the sighted; the elderly and the young; the handicapped and the general public. A paved path, easily maneuvered by wheelchairs and strollers, meanders through the woodland. Frequent stops allow people to rest or simply experience the setting.

The woodland has a wide variety of wild plants to be touched, smelled and seen. Other portions of the garden provide raised flower and herb beds and several rose plantings, including heritage and species roses as well as displays of fragrant hybrid teas. Specially designed "planted" benches allow visitors to sit and feel the grass and spicy-sweet ground covers without stooping to ground level.

Access and design are being continually upgraded. Following suggestions of a blind horticulturist and horticultural therapy interns from Edmonds Community College, emphasis has moved toward easily accessible "normal" trees and herbaceous plants as well as those which have been stereotyped for the handicapped. Major plants are labeled both in Braille and large print signs identifying the plant and telling a bit of its lore. The double labeling makes the facility practical not only for the non-sighted but also for those with impaired vision and for youngsters just learning to read.

Sierra Park is not an isolated oasis in the Puget Sound area. Through the efforts of varied groups there are special gardens at the Lighthouse for the Blind and Children's Orthopedic Hospital in Seattle; at special living facilities including King's Garden, Victoria Village, and several nursing homes in the area; and at educational and recreational facilities including Edmonds Community College and Edmonds Senior Center. Classes and talking garden books are also available to groups or individuals with special needs.

Rosarian Edith Schurr and several of the local rose clubs have been major backers of the projects and have provided or arranged for donations of hundreds of rose bushes for the gardens. Through their efforts, roses were also provided for the vocational floriculture training programs at Monroe Reformatory and Firland Correctional Center.

The Old Folks Home

Angie Menard

Last year a rose garden was started at the Old Folks Home in Kirkwood, Missouri, to satisfy the residents' aesthetic need for living, growing beauty. It was discovered that most of the elderly residents had at one time grown roses and all had enjoyed their loveliness. Subsequently the roses, donated by one of the large rose companies, were arranged in four beds immediately behind the recreation room of the Home. They can be viewed from the windows, and a ramp gives easy access. Because of the advanced age of the residents, most of the routine maintenance of the roses is done by the horticulture therapist, enabling the elderly to use their gardening skills in the rose beds without the total responsibility for watering, fertilizing or pruning.

Above, an elderly resident, Mrs. Edna Brown, enjoys the roses that have been gathered for her. Below, Mrs. Rose Mashmeier, admires the blooms in the new rose garden.

Photos by author

A major feature of the garden is that the residents are invited and encouraged to cut the roses and take them to their rooms. Table arrangements are made by the ladies for the living and dining rooms of the Home. Flowers are a welcome gift to new residents and to those too infirm to get out to the garden. Often the sight and fragrance of a rose will bring back happy memories and encourage conversation. A gift of a rose serves as a tangible reminder to a resident that he or she has not been forgotten or abandoned. The garden provides a stimulus to go outdoors and exercises the senses and minds of the residents as well as their bodies. Gardening affords a topic of conversation and gives them something to share with one another and with visitors.

Winter weather does not stop enjoyment and use of the rose garden. Throughout the summer the petals are gathered and dried. Potpourri is made by adding orris root and selected essences. The mixture is aged in glass bottles lovingly turned by the residents and then put into decorated containers and sachets. The elderly have been taught from a young age to make full use of everything, and concocting the potpourri, an ancient art, is a very positive aspect of the rose garden. The old axiom, ''Waste not, want not,'' is followed here. The potpourri is given to the residents and sold at the Home. The proceeds are used to buy horticultural supplies for indoor projects during the winter. By being able to sell the fruits of their labors, the elderly are given a new sense of self-worth as they realize that they are still able to provide something both useful and desired by others.

Our rose garden has been a life-affirming activity and a successful experiment in horticulture therapy. It has involved the elderly in an active and productive endeavor and given them a sense of personal pride and the pleasure of beauty.

GOOD SHEPHERD HOME

Sarah Anderson

When many of the rose bushes at the Good Shepherd Home in Blair, Nebraska, died, unhappiness over the poor condition of the flower beds spread among the residents. That entire summer, much of the conversation at this Lutheran home for the aged was about the rose bushes. During the autumn, some of the residents decided to find a way to replace the roses and other flowers in the beds. One lady made an afghan to be raffled at our bazaar while others gathered postage stamps, which were then sold to a stamp collector. During the long winter months, these projects continued. The residents enjoyed working for a goal they had set themselves. And many enjoyable hours were spent looking at rose books.

During this time, a member of our local rose society suggested that some of the rose companies might donate plants for the nursing home garden. Letters were written and quickly one of the large rose companies offered to supply them. We then involved family members in the project. Help was needed in planting because none of the residents was able to do that kind of work.

On Good Friday, one family came and planted all the roses while many interested residents watched and offered advice. There were as many different opinions on what should be done as there were onlookers. Everyone enjoyed the day and anxiously waited for the first flower to appear.

The bushes bloomed beautifully and the residents took great pride in showing their friends and relatives their roses. Because the bushes were a gift, the money the residents had earned bought flowers for other beds and some lawn-care supplies. This project meant a great deal to all the residents; a strong feeling of fellowship bloomed through our lovely rose bushes.

LOUISIANA STATE PENITENTIARY

Juanita Honeycutt

Therapy, according to Webster's dictionary, is exercise, to work with body and mind, to rebuild that which is weak. This is what we try to provide for the inmates here at the Louisiana State Penitentiary. We have a vast amount of space to be landscaped on the eighteen thousand acres that serves as home for approximately forty one hundred inmates.

The program of therapy and rehabilitation with roses started here many years ago. The first project was a rose garden built at the main prison complex and taken care of for several years. The inmates assumed complete charge of the entire project. However, when the primary supporter of the garden passed away and the caretakers were discharged from custody, the garden was neglected. The roses are still living but the garden is gone. This is what happens if roses are left unattended.

Our current rehabilitative beautification program is very young. Working with flowers is an ideal type of work for some inmates. It is particularly rewarding for inmates who have an opportunity to work in the rose gardens. Not all inmates are interested in this type of work program, but for the most part, they are very proud of the changes in the appearance of the grounds in recent years. These changes include the addition of landscaped grounds with lovely rose gardens at each physical plant. These gardens add a touch of beauty and interest to an otherwise monotonous environment.

As part of our program, we not only

Independence, perserverance, responsibility and horticultural skills are all a part of the rehabilitation program that involves roses at Louisana State Penitentiary.

Author

teach gardening skills to an inmate, but he also becomes aware of the benefit this training can be to him upon release.

One of our gardens has been a particularly rewarding job assignment for a certain inmate. As a trustee, this individual works without direct and constant supervision. He is one of many inmates who enjoys the solitude of working alone and takes great pride in the beauty that results from his efforts. He feels that he is making a very real contribution to the total beautification program. As a result, this man is no longer a disciplinary problem and he is learning a skill that may support him when he is released. Our goal for him will have been met.

It is not all "a bed of roses." There is hard physical labor involved, but the rewards reaped as the buds and blossoms appear make it all worthwhile. At the same time, the individual is learning to accept the fact that in order to produce, one must often work long, hard hours. This is what he will find in the employment market upon release and he must be prepared to meet that challenge.

One of the inmates, I never knew which one, sent me a sign for my rose garden with a note, "This is how I feel about my job."

A kiss of the sun for pardon
A song of the birds for mirth
You're nearer to God's heart
in a garden
Than anywhere else on Earth

WASHINGTON STATE REFORMATORY

Jerry Kluin

As a prison employee of twenty-three years in the State of Washington, I have been fortunate to have firsthand knowledge of the importance of keeping a man motivated toward a useful and productive life. To this end, it has been a privilege for me to start the first viable vocational horticulture program in the state system.

A well-known rose company helped our program get under way by donating three hundred hybrid tea roses to the Washington State Reformatory. A formal garden was developed and, with the help of the Evergreen Rose Society, a program of maintenance and production was instituted. The human effect was remarkable. Here are some instances:

Lawrence N. This man was so severely drug-damaged that his manipulative skills were practically nil. He was mentally very keen, however, and really got into roses by devising a chart and indexing the entire rose garden. Thus, whenever a new rose was added, lost or replaced, he could point out exactly what was growing on any indicated spot.

Frank P. A very intense man who was a constant problem. He had been an assistant manager of a large concern before his incarceration, and he was upset with the world. He "zeroed in" on the rose bed, however, and was soon an excellent grower and very proficient with budding. He went on to manage greenhouses while on parole.

Bill O. This young fellow developed a new technique of budding that turned out to have a much higher rate of success than the standard method. He took a great deal of pride in his successes and shared them with the other members of the crew.

I could talk at further length about the effect of working with roses and the part this has played in rehabilitating people, but suffice it to say that working with roses is a potent weapon in our efforts to redirect these men toward a solid life. ❧

ROSES OF THE FUTURE

REPORT FROM CALIFORNIA

William A. Warriner

Most rose hybridizers have certain common goals although each hybridizer should also have aims that are nearly unique, shared perhaps by some others but not by all. They should continually incorporate disease resistance, vigor and fragrance in the selection of parents. If these three traits are common goals, then each breeder has his own thoughts on other characteristics, such as ideal plant habit, flower form and color. This divergence of aims insures that there will be changes in future roses and no end in the adaptation of varieties to new uses.

In the near future, hybrid teas seem assured of continued leadership in popularity. Changes in this class will occur in color, hardiness, disease resistance and, we hope, in floriferousness. There have been many lavender or mauve varieties and there will soon be some fantastic purple, plum-purple blends and variations.

Hybrid teas have been around for over one hundred years with thousands of varieties having been introduced. Some are better, some worse than predecessors, but overall the breed has improved, and will continue to improve until plants are of ideal habit, free of disease, and bloom continually. The blooms will be of new colors and color patterns and will last much longer than at present.

We have many fragrant hybrid teas, but breeders find it very difficult to incorporate fragrance into a large selection of varieties. 'Fragrant Cloud,' 'Granada' and 'Perfume Delight' are all extremely fragrant but have not spawned a profusion of sweet-smelling offspring. 'Chrysler Imperial' passed on its fragrance to 'Jadis,' but 'Jadis' has been barren. Still, there is genetic material to work with. Rose breeders will keep trying for more fragrant varieties, and so those varieties come forth.

At one period of rose evaluation, the class called floribunda came into being and became very popular. The blooms were usually larger than the preceding polyanthas and the bushes grew almost as large as hybrid teas. It was thought, or at least hoped, that floribundas would be used more in home landscaping and therefore have great popularity, but this never proved true.

The abundant flowering of floribundas has made them very useful for further breeding, and many of today's floribundas carry flowers of real hybrid tea form and size with blooms in profusion. Some roses of the future will look like very large floribundas, will bloom in long- or short-stemmed clusters, and be very bushy, dense plants.

Some varieties classed as floribundas because of plant habit are really more like clustering hybrid teas, a trend that should influence the popularity of the class. If breeders can put well-formed, beautifully colored, hybrid tea-like blooms on medium high, heavily branched plants, we will have the ultimate floribunda. Or would that be the ultimate hybrid tea?

Breeding efforts of the 1970's in miniatures, ground covers, landscape types and hardy roses, plus the continuing interest in hybrid teas and floribundas, have laid the groundwork for the roses of the 1980's. There may be more confusion, however, in the minds of people who must have each variety categorized. Much overlapping exists now, but there will be far more. Roses will be available in sizes from very small miniatures, creepers and small climbers, through almost any size up to very large climbers. How can anyone then say where one classification starts and another stops?

Serious breeding for hardiness and disease control in the past decade has shown some promise for better performing roses of the future, but the surface is only scratched. If the tetraploid *Rosa rugosa* seedlings from the USDA can transmit blackspot resistance to new generations of rose varieties, then one of the big problems will have been removed. A few of the new pesticides show excellent disease control, but they still require an effort on the part of the gardener and cannot control completely.

Rose breeders are dedicated optimists and very persistent, insuring the public an ever-changing selection of new varieties. With a little luck, we will have hardy, clean, beautiful ever-blooming roses in all sizes and a new combinations of colors.

REPORT FROM NEW ZEALAND

Sam McGredy

It is much easier to look into the past than into the future. In the beautiful city of Paris there is a magnificent rose garden called the *Roseraie de l'Haie*, where roses are planted in beds representing each decade. It is not difficult to see the changes which have taken place between 1920 and the present. The gentle grace has gone, to be replaced by the strong colors of today—the flaming oranges, the brilliant yellows, the almost coarsely healthy scarlets. Plants are stronger, colors brighter, blooms larger. Gone are the tender pinks, the subtle fragrances, the arching stems. We live in strident times, and breeders have produced roses to match.

But times change. There is a respect for our environment as never before. There is a new awareness of the importance of plants fitting into the landscape, of planting for the future, of preserving what we have.

Rose breeders are designers, the Christian Diors of the garden. They try to lead, to dictate the fashions of the future. They will probably have different ideas over the next decade. The sense of values will be evolving. I believe there will be a trend more toward breeding better plants than concentrating on new colors. To be truthful, the rose as a plant is not a pretty thing. Too often it loses its foliage in mid-season and stands there gaunt and ugly for half its length, ramrod straight, almost flowerless between flushes.

Our new roses will be much shorter in stature, with the accent on bushiness and floriferousness. They will become more truly bedding plants, competing with petunias and geraniums in the garden centers. To do this they will have to be easily and cheaply propagated, carry more flowers, need less attention, and look good over a long period. You will note that all of this has nothing to do with the commonly accepted definition of rose novelty, flower color.

These qualities will probably come from marrying the old miniature types with today's floribundas. In recent years I have seen enough exciting work with species in different nurseries to know that our plants will be quite different. To give but one example, I have seen rose types which break very freely at ground level every year. All you have to do is cut them to the ground each spring, and back they come again.

The enormous amount of money which has been plowed into the research of greenhouse forcing roses will also pay dividends for the garden. You can expect roses of much stronger petalage, well able to cope with extremes of sun and rain. The hybridization possibilities are endless. There are dozens of species roses still to contribute to our rose breeding. While I believe the accent will be on plants and plant types, there will be new colors—real chocolate browns, chocolate and lavender bicolors, unusual combinations of all types.

Oh, yes! There is an ever-increasing watch for the fragrant rose. In the coming years our roses will be more like "that old rose with the beautiful scent my grandfather used to grow."

REPORT FROM GERMANY

Reimer Kordes

As a breeder, it is a pleasure to write this article about roses of the future, and I am sure that other breeders are thinking and planning along the same lines. Some of the important points in breeding may have different priorities, but all rose breeders have the same goal—better roses for tomorrow.

From our standpoint in northern Europe, hardiness is the most important characteristic. The second is freedom from diseases such as mildew, rust and blackspot. We know of so many good rose varieties which were free of mildew and other diseases when first introduced, but after some years new forms of mildew, through mutation, were able to infect these formerly resistant varieties.

Next, we look for more texture in the petals, petals which drop cleanly and, of course, free-flowering. Also, we always want as many flowers as possible, with clean and unfading colors. In recent years we have made progress in getting better-flowering hybrid teas by crossing them with floribundas. This resulted in improved flower form with larger masses of blooms.

The main consideration in breeding is still to produce new roses for special uses such as in landscaping and for planting flower borders and parks. For these purposes we need "carefree" roses, free-flowering shrub types which will give color among the green ornamental shrubs in gardens and parks. Some free-flowering shrub roses are available and are becoming popular in Europe.

There is also a need for compact forms of shorter floribundas for small-bed planting and for use in pots and containers. New shrub forms for hedges may come from *Rosa rugosa* and other species. In climbers, people prefer recurrent flowering. We still work with my father's line "kordesii," to get better ones such as 'Sympathie,' which has large flowers, nice scent and strong growth.

Hybrid teas are still the main type of rose for use in the garden and for cutting. Still, there is work enough to develop stronger plants, more flowers and the necessary lovely scent. We have developed better plants through crossing with floribundas. Other good plants should result from crossing with climbers, and with hybrid teas for bedding. But for this we need good, free-flowering, strong plants—floribundas, from single ones to hybrid tea forms, with keeping quality in flower and color; more use of existing ground-cover forms; carpet roses to give new ideas for use in parks and gardens.

For the cut-flower industry and for the rose lover, we have taken steps in recent years to get better keeping quality in cut-flower roses, for longer vase life. This will give the rose industry a better chance to compete with other long-lasting flowers such as carnations.

The 'Mercedes' group and 'Golden Times,' with better texture in the petals, good production under glass, and easy handling for a really good vase life, will help the commercialization of cut-flower roses. As these flowers are easy to transport over longer distances, there are greater possibilities for growing them in other and better climates, and with lower energy requirements.

Despite all the progress which has been made, the breeder still must cope with the competition from other garden plants, from perennials and summer flowers and, in the greenhouse, between roses and other cut flowers. Our attention must be to our breeding work. Rose breeders must give the rose lover better roses with more pleasure; the towns and parks, "carefree" roses; the cut-flower grower, better performance, easier handling and longer vase life.

We must look forward to make certain that the rose will keep its place as number one in the competition with all the other plants—so that the rose will now and in the future remain the Queen of Flowers.

Particularly on Miniatures

Harmon Saville

Miniature rose breeding is just entering a dynamic and exciting phase of evolution. As recently as five years ago there were few breeders working on miniatures and, of necessity, their efforts were limited to relatively few breeding lines. Suddenly breeders from all corners of the world are taking an interest and are developing many new breeding lines. The results are dramatic improvements and a manifold increase in new varieties. The public has responded with great enthusiasm.

In the United States the future emphasis will be on miniatures in which the size of the flower, leaves, thorns and plant are in perfect but diminutive proportion. Given the requirements for perfect miniature proportion, the preference will be for the moderate sizes. Plant heights of 8 to 15 inches and flower diameters of ¾ to 1½ inch will best suit. The smallest miniatures, which I have called micro-minis, have less acceptance because of the difficulty in growing them and because of their diminished display value. The larger miniatures, maxi-minis, if you will, are spurned because they are "not miniatures." The main breeding thrust will therefore be in the mid-range size, with only the exceptional micro-mini or maxi-mini becoming popular.

Breeders who are working for the European market are emphasizing the display value aspect and are developing low-growing compact plants with larger flowers. They see miniatures as an extension of the very large floribunda market and visualize miniatures of the future as very low-growing plants with lots of color and ideal for bedding and container culture.

Eva Melady

Dramatic improvements will be made in flower form. Although miniatures reflect all types of their larger counterparts there will be more and more tiny elegant flower forms featuring high centers, long pointed buds and classic hybrid tea-like shapes. Color will be available in all hues and shades, as in the large roses. The colors will be clearer and more stable with the emphasis on attractive finishing color. Fragrance will become more and more available in miniatures and will include the sweet and spicy and the damask "rose scents" that are so popular in both older and more modern roses. Foliage will become more glossy and leathery with greater resistance to disease and pest attack. And plant habits will become more compact and symmetrical.

Miniature roses lend themselves to pot culture, therefore making it possible for anyone to enjoy growing roses. They can be grown in sunrooms, on patios, on balconies, in window boxes or indoors on a sunny window or under fluorescent lighting. Miniature rose growing is within the capacity of everyone, from the elderly to the very young.

Varieties have been developed that made outstanding displays as compact, profuse-blooming pot plants. I expect these miniatures will be grown as a commercial pot plant crop to be used in gift-giving for special occasions to supplement cut roses and to be a bit more "special" than potted mums or African-violets.

All in all there should be a dramatic overall improvement in miniature roses, much like the evolution of hybrid teas and floribundas in the past thirty-or-so years. Because the genetic material is available, the changes will take much less time. ❧

Eva Melady

AN INVITATION TO JOIN AND ENJOY

A man does not plant a tree for himself;
he plants it for posterity.
—Alexander Smith

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are $15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to PLANTS & GARDENS, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

....cut off here..

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BROOKLYN BOTANIC GARDEN RECORD / PLANTS & GARDENS
V l 36 N 2 Summer (August) 1981 #91

HANDBOOK ON

ROCK GARDENING

GETTING STARTED
Best Plants, Sites, Soils
KEEPING GOING
Growing and Maintenance
Propagation, Overwintering
ADVANCED TECHNIQUES:
Rocks, Walls, Tufa, Scree

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BROOKLYN BOTANIC GARDEN RECORD
PLANTS & GARDENS

ROCK GARDENING

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Gottscho-Schleisner

Good "bones" help, as in this natural rock outcropping of classic design, which suggests many ideas for the innovative gardener.

Letter from the Brooklyn Botanic Garden

Why do miniature plants hold so much fascination for us? Is it the natural grace of many, with flowers in perfect proportion to foliage and plant size? Is it the association some have with the Matterhorn, Mount Washington or Mount Rainier, places of untamed and mythical beauty? Or is it because there is space enough for a first-rate rock garden on even a quarter-acre property? Whatever the reasons, rock gardening is booming again, and it is high time for a new Brooklyn Botanic Garden Handbook on the subject.

Our friends in the American Rock Garden Society must share responsibility for the new interest. They have one of the most active plant societies in horticulture today, and it is a pleasure for BBG to collaborate with them. Under the guest editorship of Marnie Flook of the ARGS, they have given generously of their time, effort and expertise to make possible this gardening manual, which should be of particular appeal to those just getting started in the field. Our very warm thanks go to each and every Contributor.

Rock gardens have come a long way from the stone burial mounds that some of them once seemed to be. An artistically constructed rock garden is one of spring's most beautiful sights. However, it need not be a one-season garden if the "bones" are good and the choice of plants is made with care. Carefully read Karl Grieshaber's article about the types of rock garden before turning to the various descriptive articles on plants.

We all have favorite ways of displaying plants, not to mention favorite plants. The raised bed makes eminent sense for many of us over the age of 23 and avoids the problem of little gems being overlooked or trod upon! See Francis Cabot's article on the subject and, for flatlanders, Donald Havens'. And if you are an urban gardener who wants to try something different, scrutinize Eleanor Laden's thoughtful contribution for city dwellers as well as Richard Redfield's and Erica Greenfield's on plants for shaded areas. There are rock garden plants for a host of imaginative uses, and it is up to us to put these miniatures of nature to work with sensitivity.

Why not a rock garden in your future?

Sincerely,

Frederick McGourty

Editor

Photos: W. M. Flook

An introduction to the world of . . .

ROCK GARDENING

H. Lincoln Foster

Rock gardening as a recognized specialty does not have a long history in the total chronology of horticulture, but some aspects of its particular way of presenting plants in the landscape go as far back as ancient China and the hanging gardens of Babylon. Today there are many gardeners in many parts of the world who think of themselves as rock gardeners. They have banded together in local, regional and national associations, and even periodically come together for an international "rock plant" conference.

Some of these associations have in their name the word "alpine," a word that in a sense does announce their interest and enthusiasms, but one that also makes them uncomfortable because of its semantic limitations. What they want is a designation that spells out for them and the world their interest in that seductive combination of dwarf plants with brilliant yet proportionate flowers and a landscape that presents these plants in a setting that combines an environment that is congenial to the plants and also one that is aesthetically pleasing.

The first of these dual requirements is defined for the gardener by the natural situations in which these dwarf floriferous plants have evolved in nature. Some are, indeed, truly alpine. There in the high mountains in various parts of the world above the wooded slopes are a variety of open habitats, each occupied by a particular mixture of plants. In general terms there are five basic areas:

1. **Alpine meadows** where humus has accumulated through the decay of successive vegetation over long periods of time. This is a fairly stable landscape, with only local soil movement from frost action. These areas are occupied by many grasses and sedges, interspersed with showy flowering perennials and only a few annuals.

2. **Peat beds.** These occur in pockets in the alpine meadow zone where steady

saturation of the site slows down the organic matter decomposition or in climatic areas where temperatures are too low for soil-decomposing organisms to flourish. These peaty sites have their own special flora, frequently ericaceous.

3. Unstable broken rock areas. In most mountainous regions there are areas on steep slopes where broken rock, rather precariously balanced, accumulates. These talus slopes or screes are not thickly vegetated as a rule, but there are plants that have evolved to occupy these sites and therefore are less subject to the jostling by grasses and sedges and other aggressive colonizers. Unstable rocky conditions are also found in permafrost areas, recently expanded glacial moraines and even in areas of comparatively recently exposed sandy coastal regions.

4. Solid rock ledges and cliffs. These occur primarily near the summits of mountains, but they may also be found at lower elevations where, because of the conformation of the land, deep soil or broken rock particles have not accumulated. Here in crevices and fissures in the solid rock certain plants find a congenial home.

5. Woodlands are still another pertinent area for rock garden plants. On the shoulders of the mountains and in much of the temperate zone the primary vegetation is trees, beneath which there is built up, on the rock substrate of the earth, a rich bed of humus from the long decay of leaves, branches and the defunct bodies of microorganisms that have worked on the forest litter. Here in this bed of organic matter a wide assortment of plants thrives. From them we select the most beautiful and elegant and learn to grow them in our own gardens.

These broad descriptions of the sorts of sites where rock garden plants grow naturally furnish the rock gardener only with essential clues to successful growing and to appropriate presentation in the garden setting; the natural habitats offer real suggestions about soil composition and the siting of individual plants. Fortunately, in the literature, either in specialized books or in the bulletins of the rock garden societies, there are specific descriptions of where these rock garden plants grow naturally. These descriptions encompass a wide variety of plants from those that are referred to as easy to the very tricky.

What one learns by a slow process of

An alpine meadow high in the Canadian Rockies with *Dryas octopetala* in bloom among the rocks.

trial and error is that the easy plants are really easy and the difficult ones are really difficult. Once a rock gardener has done well with the easy ones almost inevitably he is drawn along to experiment with the more challenging and the little-known. In fact, as the number of devoted growers increases this is how more and more plants march into our rock gardens. Sometimes the introductions are on a large scale when knowledgeable collectors are financed by subscription to explore remote mountainous areas to discover new plants or to reintroduce earlier ones once found but since lost to horticulture. These excursions serve not only to enrich our gardens with seeds and plants, but also to expand our knowledge of the climate, soil and exposure in which this ever-increasing bounty of plants is found growing in the wild.

Some of these plants have resisted adaptation in our gardens no matter how scrupulously we try to imitate the conditions under which they are found growing in nature. Others of these reluctant creatures have been cozened temporarily in pots in alpine houses where conditions are carefully controlled and the successful grower, beaming with pride, displays his untameable wildling at a show amidst the praise of fellow rock gardeners. Then his treasured plant on its return from the jostle of the show bench, back to the environment of the alpine house, begins to pine!

But among rock gardeners in general, and even among the plants, there is resilience. This leads to one more try, and then another. And frequently the plants seem to respond sympathetically. Some plants, long thought rather intransigent, have over periods of trial settled rather docilely into the horticultural world, probably by a persistent selection among the most amenable. But then, how do we present this fabulous array of plants in our own backyards?

A pretty firm notion about what constitutes the soil of meadow and bog and scree and woodland has been acquired by reading or by visiting the native haunts of rock garden plants. We have learned, frequently by trial and error, that we must temper the conditions to fit our own geography and climate. But in some ways the most difficult part of rock gardening is the actual placing and building of the garden itself.

The Rock Garden Today

A rock garden used to be thought of as a structure rather precisely copying a natural segment of mountainous scenery, remote enough from man-made features so that there would be no conflict, remote therefore from the house and formal portions of our landscape. That meant one would need a sizable property, so, in general, rock gardens originally were to be found almost exclusively on the grounds of the wealthy. Today our grounds and our wealth are more limited. We must think smaller and the rock garden therefore becomes a more intimate part of our home environment.

No two settings are identical, of course, so it is impossible in advance to draw a floor plan for the ideal rock garden. Your plot may be absolutely flat and square, or it may be a strange shape with outcrops of rock ledge, or full of dips and rises. Your house may be perched on high foundations or nestled on low haunches. All of these features can give clues to the sort of rock garden you may wish to incorporate into your landscape.

Happily over the years there have been adventurous and imaginative rock plant enthusiasts who have devised a variety of formats to combine the conditions for successful plant growth with structures aesthetically compatible with a wide range of sites. If in the back corner of your property you have an outcrop of bedrock, you start there. If your house is perched in the center of your lot and the land falls away to the street, you have a setting for walls. If you have a small flat piece of land about your house and you wish to make most of it into a level patio, there are corners of the patio for small rock gardens. The low parapet around a patio is the ideal setting for a series of planters, each representing a small and special micro-environment for small and wonderful plants. If there is a stream that courses down the property, the banks may be diversified by a small group of ledges, a small bog, a small scree.

We must remember, also, that in many

sections of America our home landscapes are carved out of a woodland, and we treasure the trees for shade and comfort. Compose your rock garden with trees as features. Prune them high to let in enough light, build your walls and beds with proper soil, and you will be amazed how many plants from around the world will settle comfortably into your landscape. Or you may prefer to maintain the woodland setting almost entirely undisturbed. There is a wide and glorious range of plants suited to these shady settings. These plants also become an important part of the province of rock gardening.

What, I suppose, we rock gardeners primarily devote ourselves to is the cultivation of wildflowers from either those many mountainous areas of the world, whether forested or above tree-line, or from the tundras, or the pine barrens, or river banks, or sea shores; those bewitching forms of foliage and flower, generally compact and floriferous, for which we try to provide a home in our private landscapes. To do so we study their growing requirements and we try to devise a small world in our own private bailiwick where they are presented for real pleasure to us and to our visitors. ☘

LATIN NAMES AND COMMON NAMES

Latin was the international language of science two hundred years ago when the present system of naming plants and animals was started. The names are precise and understood all around the world. When the generic and specific name is used, a plant is set apart from some 200,000 other plants. Botanical names are employed all the time: *Iris, Crocus, Astilbe, Aster, Catalpa, Trillium, Campanula, Narcissus, Viola* and *Phlox* are Latin or Greek words. Other plants are named in honor of someone (*Lewisia* for Meriwether Lewis) or for their supposed medicinal qualities (*Hepatica*—liverwort) or from mythology (*Hyacinthus*). These words describe groups (genera) of plants with similar characteristics—they are generic names. Every plant has a generic (genus) and a specific (species) name.

Species names often describe something special about the plant, making it easier to remember. The word might describe the leaf (*angustifolius*—narrow-leaved); the flower (*grandiflorus*—with large flowers); size (*nanus*—dwarf); color (*albus*—white); habit of growth (*repens*—creeping); habitat (*rupestris*—rock-loving); place of origin (*chinensis*—China). An example is *Linnaea borealis,* which gardeners call twinflower. The genus name commemorates Carolus Linnaeus, whose binomial system (genus and species name) is the one in use today. The species name *borealis* means of northern regions and is where this beautiful little plant is found.

Confusion sometimes occurs when common names are used. A bluebell may be a *Campanula, Mertensia, Scilla* or *Muscari* depending on the gardener with whom you talk. Mayflower may be one of twenty-five or thirty different plants. Common names differ in various parts of the United States. And to quote Reginald Farrer: "It is absurd to pretend there can be a common English name for an alpine plant neither English nor common." New rock gardeners become used to Latin names quickly when they realize that most plants don't have common ones. With three hundred or more species in each of the genera *Campanula, Gentiana, Primula, Dianthus* and *Saxifraga,* proper identification can only begin to be made by using the Latin names. This is important because if you want to learn about a plant, you must first know the name, which is a key that unlocks many doors. Do not shy away from rock gardening because its practitioners frequently use Latin names for plants. If you can say *Chrysanthemum* you are halfway there.

Want more information? See A. W. Smith, *A Gardener's Dictionary of Plant Names,* rev. by W. T. Stearn (St. Martin's Press, New York). —*M. F.* ☘

BEFORE YOU BEGIN

Karl H. Grieshaber

A rock garden is not nature but a work of art, something artificially created which makes use of natural means to form a different but always harmonious picture. It allows a certain independence, for more habitats can be represented and a wider range of plants can be grown than would be found in a similar area in nature. Nature is outwitted and plants are made to grow in places where, if left alone, they would languish and die. We want to attain in a rock garden local visions which nature would never venture on its own. When plants are selected, their value at maturity to the composition should be kept in mind. And always the garden must relate to the human scale. There is no place for miniature Matterhorns.

Site

Often the first choice for a rock garden is on a site which is not needed for anything else, or proven to be difficult to tie in with the general design of the whole garden. This is not always the best spot.

For general classification rock gardens are formal or naturalistic. With that in mind, we can visualize which kind will fit best into the existing landscape. The formal style is usually close to the house, sometimes in the form of terraced walls, or as wide steps with enough open space for plants.

Observe the sunrise, sunset and sun exposure at high noon, and also the main wind direction. A southern exposure ensures the maximum amount of sunlight for sun-loving plants. However, it exposes them to prolonged summer heat and to the injurious effect of the alternate freezing and thawing action in winter. Some plants, including a number of bulbs, benefit from a summer baking, but a northern or even an eastern exposure is preferable for most.

Avoid a site which cannot be properly drained. Bear in mind, alpines grow under widely different conditions, but they do not tolerate sour, badly drained soil. Also, alpines will not grow well in gardens exposed to cutting winds. Do not build a rock garden under the branches of trees or between buildings where there are strong drafts and continuous shade.

A factor which may indirectly affect the choice for a rock garden location is the provision for water for pools and streams. Only in a few gardens is natural water found, and if this feature is desired, usually it must be created artificially. A rock garden doesn't necessarily need a watercourse, but it surely enhances the character of such a garden.

No work should be started before a suitable position has been selected and the decision made from which direction the garden most likely will be seen. The foreground and background of a rock garden are very much part of the composition and have to be considered in the choice of the site. The purpose is to bring a natural attraction into the garden which hides all objects of a distracting nature and won't let the eye stray from the garden itself.

Stone

A natural rock garden is usually better placed some distance from the formal part of the garden, which as a rule surrounds the house. The aim is to select and arrange the rocks in such a manner that each appears as a natural deposit which was there originally and not arranged by man. A rock garden is not a meaningless jumble of rocks showing drill marks or glaring and newly exposed surface.

The best stone for the rock garden is that of local origin. The porousness of the stone is a factor of considerable importance because the stone stores moisture and the ground underneath is always cool. Alpine plants grow well in this situation and press their roots as close as possible to the side of a stone. In this respect sandstone and limestone are the best materials for rock gardens. Granite is also good, but hard, and gives an acid reaction to the soil. Quartz is too hard and conspicuous.

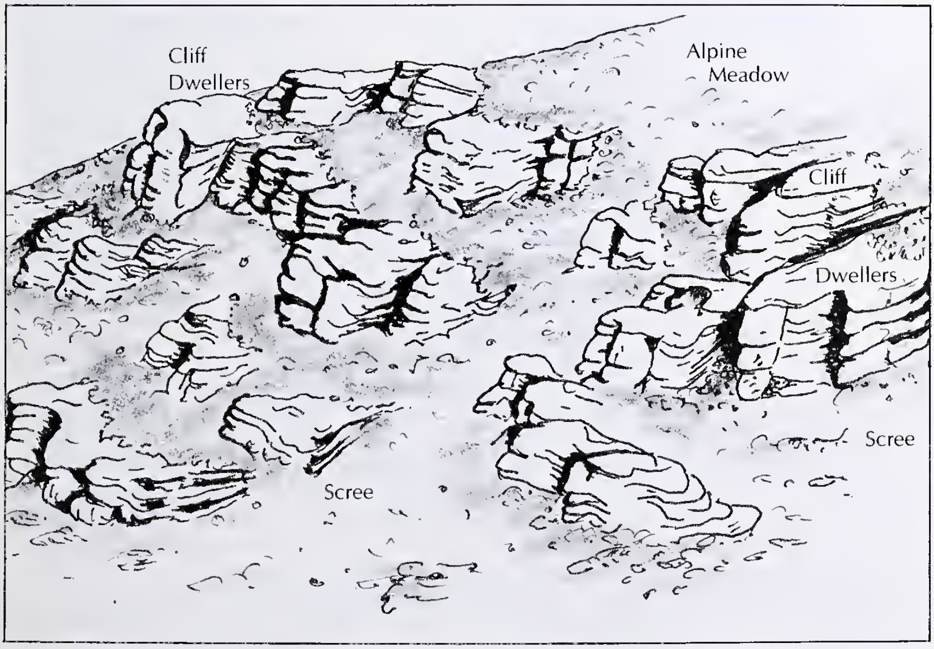
As a rule, granite, trap rock, glacial boulders and conglomerate rock weather in round forms. They can never be made into a stratified outcropping. Their place is on a rugged, boulder-strewn slope. Some are scattered, others are in dense steep clusters. On a rather steep slope the dominant effect of the rock should be that of a stream-cut bank, with the softer material laying bare the outcropping boulders.

The size of the rocks used should be determined by the scale of the garden. Large stones give the effect of strength. However, a big boulder in a small garden makes the area seem smaller. Too many small stones give an artificial and weak effect. Only weathered boulders should be selected and embedded into the soil to their weathered line or their widest circumferences.

When using stratified rock such as limestone or sandstone to attain a natural effect, it is necessary to understand the stratification and jointing of this type of rock. The lines of stratification are traceable through the entire formation. In the garden the angle at which the strata are inclined does not matter so long as it is retained throughout the placed stonework. A backward tilt has the advantage of holding some of the rainfall and conducting it into the soil. With some ingenuity it is possible with this stone material to provide a variety of crevices and planting spots, some in full sun, others where it is cool and shaded behind a bend or a larger rock.

Hillocks or Stone Knolls

Many old hillocks planted with alpines can still be seen in botanic gardens in Europe. They are not more than six feet high or four feet wide at the base. Even today some collectors insist that this is the most practical way to grow and display plants native to the same habitat. Such hillocks are of particular value to botanic gardens in presenting geographical collections, but they may be modified in purpose and form in various ways for the home garden. For example, if the space available for the rock garden



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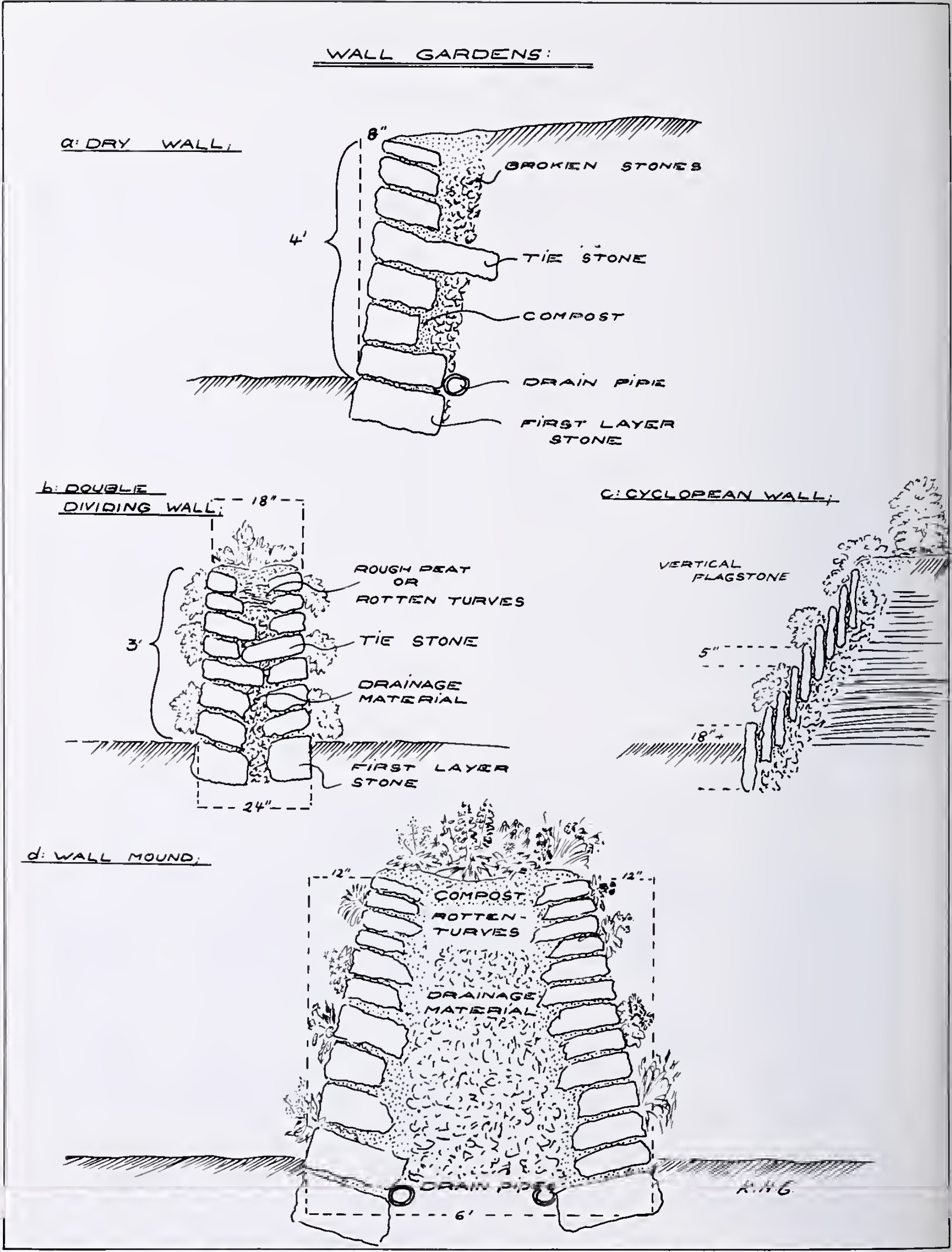
A schematic drawing of a condensed alpine garden including rock outcroppings, meadow and scree.



Wall gardens in side view to show construction. The dry wall is a modification of a typical stone retaining wall, readily adapted from an existing stone wall; the others are rather more ambitious undertakings, but serve the requirements of many rock garden plants. (See the article on elevated alpines, p. 57, for additional information on wall gardens.)

happens to be along a low wall, the face of a small cliff or on the side of an excavated soil bank, it would be suitable to pile the stones in such a manner that they form extended terraces. They also should run parallel with the wall and have grades like stairs up to the top.

Freestanding hillocks have the advantage of accessibility from all sides. We thereby gain a multitude of planting areas and are able to place the alpines according to their preference for a particular exposure on the hillocks. As a rule it is better to build several stone knolls close together and with a steep escarpment, than to build a rambling mountain of boulders. This way we gain numerous intermediate spaces which can be used as walkways between the rock parcels. During winter, plants are less exposed to drying winds and drifting snow often fills the passage, or it can be filled with snow and covered with branches. This somewhat resembles the depressions or little valleys in the mountains where snow remains to early summer. Plants thus are not forced into premature growth in spring, to be damaged by late frosts.

Properly constructed hillocks have plenty of crevices for cliff dwellers. Plants also have excellent drainage and are close to eye level. The viewer is right in the middle of the garden surrounded by this alpine environment, not looking at a garden which faces in only one direction. During construction it is fairly easy to incorporate a mist or sprinkler system to keep plants moist and cool—and to simulate the clouds and fog in the mountains.

The construction of these stone hillocks or knolls and the placement of the individual stone groups are important. They should not give the artificial appearance of a dry wall, nor should the rocks be scattered frivolously on top of a soil mound. The natural effect of erosion caused by water and wind is what we are striving for. Such a garden will look more natural when constructed on a slope or, even better, on two opposite slopes with a small stream going through. However, if done skillfully, level ground will do as well. In this case it is more-or-less a sunken garden with the excavated soil used on the sides.

In building these knolls, the material in the lower and middle layers, through which the excess water can trickle and drain off, should be the same. Broken stones of all sizes, sand and fragments of bricks should alternate in strata-like layers with bales of peat moss mixed with some loam. This nucleus of the knoll is faced with weathered stones, quarry stones or ones from old walls in such a way that many niches, crevices and terraces are formed. Still, we have to keep in mind the natural strata effect. All stones face a common main direction and all stones tilt at the same angle. ❧

WHAT KIND OF SOIL?

Most of the well-known rock garden plants are fairly tolerant of different soils but retain their neat and lean character best in a light sandy one to which some peat moss or leaf mold has been added. If it is necessary to add coarse builder's sand (never beach sand) to improve the structure of clay soil, always incorporate organic matter too, otherwise concrete will result. Fertilizing is seldom needed; these plants are not gross feeders. Nothing is sadder than an obese *Onosma* or tubby *Thlaspi*. Good drainage is far more important. In fact, the most important thing of all.

In the main, rock garden plants benefit from a closer-to-neutral soil pH than do trees or shrubs, and some require alkaline conditions to grow well. Plants from very dry areas in nature usually respond favorably to alkaline soil, woodlanders to an acid one. Dolomitic limestone is the customary corrective for an unduly acid soil. If pH is a special concern, your local county agricultural agent can give you information on how to submit a soil sample for testing. ❧

A few points to remember concerning . . .

PLANTING AND CARE

Anita Kistler

Preparation. Rock garden plants are small and often choice. Many can be grown in a small area, so careful preparation of the ground is advantageous. This includes the removal of all weeds and mixing the soil to desired consistency. The rocks should be placed and planted into the sloping ground to eliminate erosion that might occur.

Trees. An open, sunny site is ideal for most rock plants. (For exceptions see pages 29-35.) Because of root competition and excessive shade, the garden will probably not be successful if you build it under old trees. Avoid walnut and maple trees especially. Walnut roots have a toxic effect on many plants growing nearby, and maples are shallow-rooted, taking more than their share of moisture and nutrients from the top layer of soil. Some kinds of bulbs are successful under an established maple if they get a desired summer baking, but most rock plants quickly succumb. Deep-rooted trees, notably some of the oaks, are a better choice for site.

Dates for planting. You can start as soon as frost has left the ground in spring and the winds have dried the soil enough so it does not clot. In most areas planting continues until mid-June, then stops during the hot months of July and August, and recommences for the month of September. There are of course regional variations. Late-autumn planting is inadvisable in colder parts of the country because roots do not have a chance to get established before the ground freezes.

What to Do with New Plants

Container-grown material. Plants bought at a garden center or nursery can go directly into the rock garden. Make a hole bigger than the ball or container, fill underneath and around with a mix of loam, leafmold and sand. Water the plant slowly until a small puddle is formed around it. Keep watering daily until the plant looks established. Shade the new plant for a few days.

Shipped plants. These may arrive in a growing mix or bare-root in sphagnum moss, wrapped in aluminum foil. They will have been out of the light for several days, so are quite tender and yellow. Treat them as cuttings, putting them into a sand or peat bed, depending on their needs. Keep them out of direct sunlight for a few days. The bed should be constantly moist, not soggy. Keep the foliage dry.

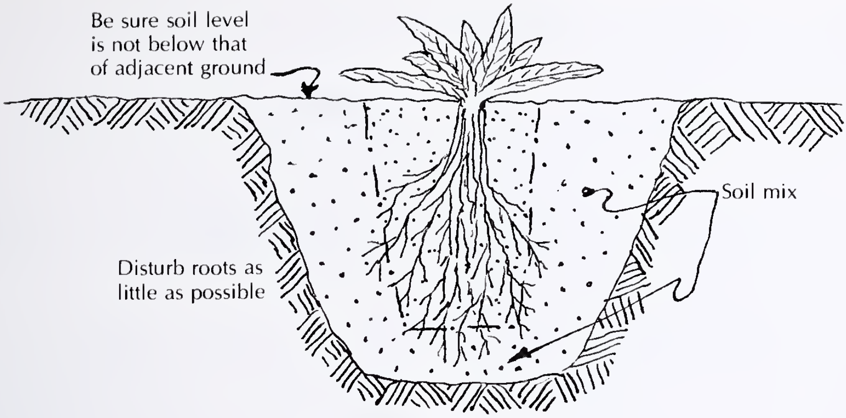
Depending on their rate of recovery the plants can be moved into the rock garden in about five weeks. Leave the root system in as big a ball as possible to make the disturbance minimal. Shade the plants for several days, watering frequently until they look established.

Seedlings. Before they attain much size, these should be transplanted from seed pans to individual pots and allowed to grow on. The seed-pan stage is a matter of weeks or a few months with most plants. However, seedlings of gentians should be left in the pan for a year to develop good root growth, then transplanted in early spring. The following spring or early summer, these plants can go directly into the rock garden if they become big enough. There, they too are shaded and watered until they look established.

In the North, do not put seedlings into the rock garden in autumn or early winter. They will likely heave out of the ground with intermittent freezing and thawing. Keep them potted in the cold frame over winter.

New plants. When you buy a rock plant either locally or shipped across the country, try to take three cuttings from it immediately, provided it is not too weak or small. Sometimes the parent plant does not survive the move, but the cuttings do. You will at least have several plants as a result. Experiment with growing these plants in different exposures in the garden.

All drawings by author



Planting a container-grown plant.

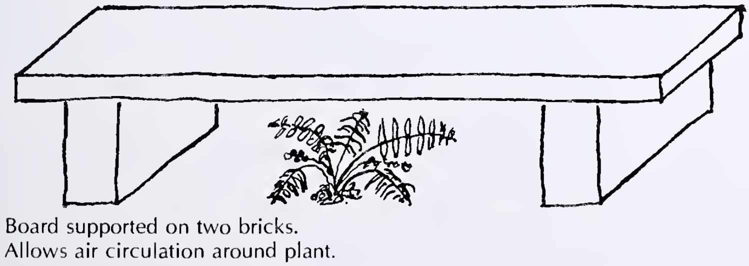
Care

Mulching. The need for mulching varies with the site and kinds of plants grown. With rock plants it is often the difference between success and failure. A good mulch reduces the germination of weed seeds and the need to water. Plants requiring a distinctly acid soil, such as azaleas, rhododendrons and vacciniums (cranberries, blueberries), benefit from a 2-3″ layer of pine needles or oak leaves around the base. It is wise to add to the layer each year.

Most of the sunloving rock plants thrive in a stone-chip mulch about 1½ to 2″ deep. These chips keep the soil underneath several degrees cooler than soil without a mulch. The foliage and blossoms are not spattered by storms. More important, the mulch keeps the tight rosettes from rotting in damp or humid weather from water sitting in their midst. Best avoid wood-chip mulch for sunloving rock plants. The wood retains too much moisture and encourages fungus and bacterial infections.

Top dressing. In spring and/or fall, combine some stone chips with a mixture of humus and garden loam. Broadcast this over the rock garden, especially in the older sections. Each time you plant, the old stone chips are disturbed, so be sure to add a mulch around newcomers to the garden.

Longevity. Not all rock garden plants are long-lived, though the majority are


Board supported on two bricks.
Allows air circulation around plant.

Sheltering a newly-planted specimen until it is acclimated to the site.

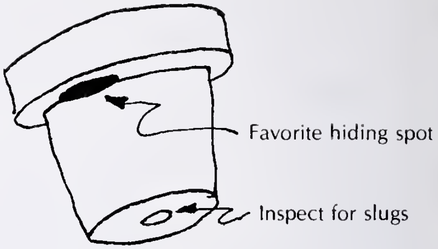
classified as "perennial." Learn as much as you can about a plant's habits and needs before adding it to the garden. Some plants, regardless of their designation as perennial or biennial in their native haunts, act as annuals in the garden. One of these, from Morocco, is an attractive small daisylike plant with trailing stems, *Anacyclus depressus*. Let such growers go to seed! Bury a few seeds directly in the ground where they grow, then each year new plants will appear. *Linaria alpina* and *Erinus alpinus*, which are both related to the snapdragon, are also delightful but impermanent additions. Again, let a plant or two go to seed and self-sow.

Some other rock garden subjects, such as basket-of-gold (*Aurinia saxatilis*), become very woody and straggly after a few years. When this happens it is wise to remove the plant entirely and replace with a well-rooted cutting of this popular, otherwise undemanding grower, or another favorite.

Deadheading. A garden looks neater if the spent flowers are removed as soon as bloom is finished. However, if you are interested in collecting seed of the rarer rock plants, you have to allow some of the flowers to set their seeds. For the few alpines which are true annuals, this is the only method of being assured of their continued growth in future years. Annuals such as *Androsace lactiflora* (*salicifolia*), diamond flower (*Ionopsidium acaule*) or Dahlberg daisy (*Dyssodia tenuiloba*) can then self-sow for you, if they will.

Shaping. Certain plants, after they have bloomed, become lanky and may even sprawl. Arabis, basket-of-gold and some dianthus are among them. Do not hesitate to cut them back. Among woody plants, many heaths and heathers (*Erica*, *Calluna*) are guilty of the same unfortunate habit. These should be cut back sharply right after blooming, but no later because flower buds for the next year may be cut off, too. Your woody plants will stay more compact and last longer if carefully pruned yearly.

Fertilizing. Among the few rock garden plants that require extra nourishment are primulas and gentians. Primulas respond to a loose rich soil, frequent division and transplanting to a different part of their bed. Gentians respond to a rich soil. The smaller and horticulturally choicer kinds of gentians grow in the wild in open pastures which are fertilized by the grazing cows. Remembering this, throw in a handful of spent manure at the bottom of the hole when planting.



Slugs can devastate a seedling pot or bed.

Weeding. Before starting your rock garden, remove all weeds, roots of weeds and any bits of stolons from nearby grasses. Spending the time on this task at an early stage means less maintenance work later. Choice buns can be lost overnight to a big invasive weed. Keep the garden weeded regularly. Get to know your weeds. If in doubt, leave a seedling until you have determined what it is. Too often, gardeners pull out desirable self-sown seedlings. Pot up these known seedlings as gifts for friends or as donations to American Rock Garden Society plant sales.

The stone-chip mulch is a deterrent to weed seedlings but, curiously, seems to encourage germination of rock plant seeds. (The best self-sown seedlings grow in the stone chips of the paths!) Even so, you are going to have weeds. Dandelions, chickweed, purslane, shepherd's purse and that invader of mats of sempervivums, *Oxalis corniculata*, are the prevalent offenders in many gardens. They are easy to remove with an asparagus fork, but the only way to get rid of the oxalis is to take up the entire clump of sempervivum and replant rosette by rosette.

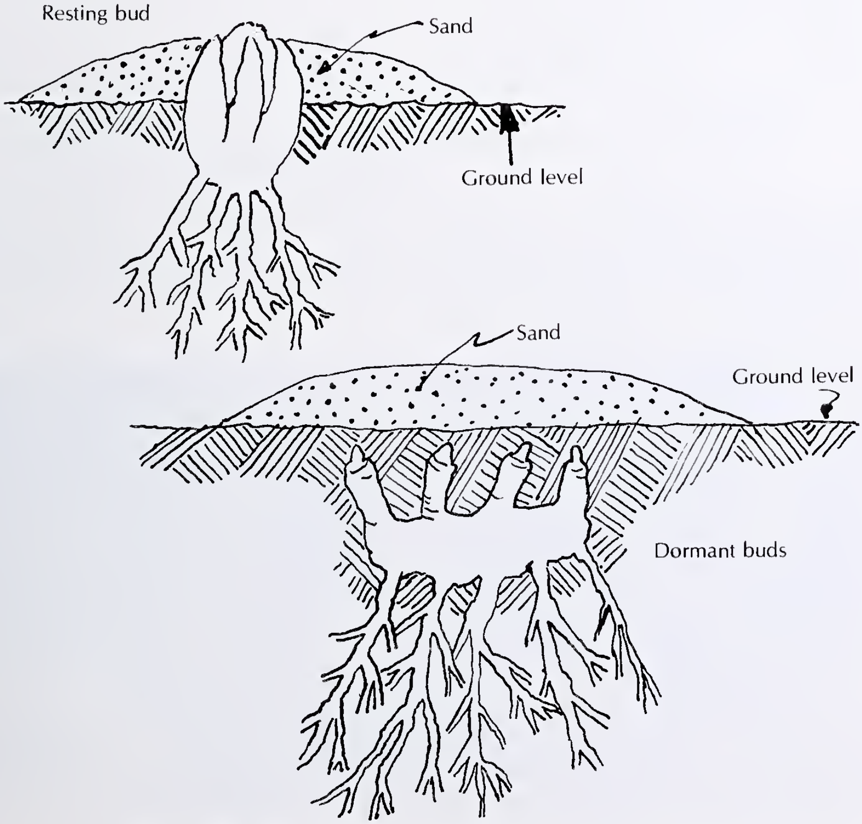
May I also strongly suggest that you not use chemical weed-killers in your rock garden? Some of these plants are tricky enough to grow under normal conditions without putting an additional strain on them.

Clean-up. In early spring, before new growth has started, clean out the dead or badly marred foliage in plants. The rock garden will be more attractive, and the dead foliage can harbor bugs and unwanted moisture. Doing it early helps you get active before the ground is ready to be worked or planted.

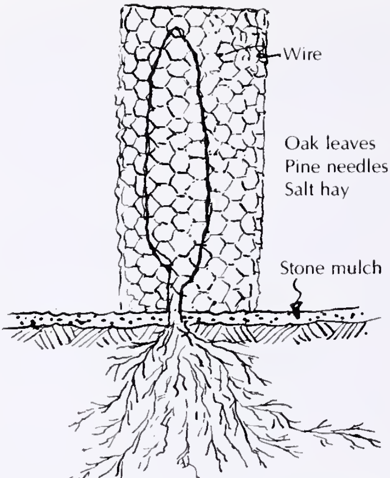
Pests. Fortunately there are rather few bugs that like the rock garden. Aphids are an occasional nuisance, as they are in any kind of garden, but they can be controlled easily with malathion or other approved insecticide if an outbreak is severe. Spider mites love primulas, azaleas, rhododendrons, androsaces and saxifrages. Spraying is the most practical way to eliminate these pests. Use a malathion spray cautiously, always according to directions, on a windless, dry day. Three sprayings, ten days apart, should catch all hatching eggs.

If seedlings seem to be cut down overnight, lift up flats or pots and inspect for cutworms or slugs. Both have voracious appetites for tender seedlings of campanulas and other choice plants. (See article on slugs in BBG Handbook *Gardening Without Pests—Ed.*)

Winterizing. You may have a favorite plant or two which is questionably winter hardy in your area. Here is a safeguard.



Protecting selected perennials for the winter with a layer of sand.



Some woody plants may need more extensive protection to get them through the winter.

While weather is still nice in the autumn, take three cuttings of the plant in question and place them in your cold frame or propagating bed. When the parent plant has gone dormant, sift sand over the resting bud or in among the dormant shoots. The water from rain or melting snow will not then sit on the susceptible parts and cause rotting.

For those woody plants which need protection, use a non-packing substance such as oak leaves or pine needles, salt hay or excelsior. These are held in place by a ring of chicken wire of the necessary height. Avoid maple leaves and wood chips, which compact and retain wetness.

When spring approaches, remove a small amount of cover at a time (on one day). Foliage under this cover is very tender. Let it gradually get accustomed to light and cold. Uncovering the entire plant in one day when the temperature is in the 50s, with a nighttime fall below freezing, can cause even a normally hardy plant to depart this world. ☙

FIVE PLANTS TO BEGIN WITH

It is easy for a newcomer to be confused by the great wealth of rock garden plants. Here are five attractive and sturdy ones to start with. Watch out, though. They are habit forming and you will want to go on to others.

Rock cress (*Arabis alpina* or *caucasica*), basket of gold (*Aurinia saxatilis*), perennial candytuft (*Iberis sempervirens*), moss pink (*Phlox subulata*) and *Sedum dasyphyllum*. For descriptions see the article beginning on page 21. ☙

Roche

A rock garden with perennial candytuft (*Iberis sempervirens*), a good candidate for the beginning rock gardener.

Step-by-step practical methods for . . .

INCREASING YOUR PLANTS

Alan Slack

Contrary to common notion, most rock garden plants are sturdy fellows. They have to be in order to survive the rigors of their natural climes. To continue as species, they must grow and produce offspring. One of the most enjoyable parts of rock gardening for me is the propagation of these plants. It is important, too, because many rock garden treasures are unavailable as plants from nurseries and can be obtained only from seed or cuttings. The several rock garden societies throughout the world are the best source of seed of the rarer kinds. Cuttings themselves are best obtained from rock gardening friends.

Propagation by seed and by stem cuttings is simple, and reasonable success can be achieved if a few easy rules are followed. Division, a method employed for the more vigorous kinds of rock gardening plants, is fast and efficient. It is discussed at length in BBG Handbook #87, *Perennials and Their Uses.* As for increasing plants by seed and cuttings, methods which are often used for slower-growing and rare sorts, the ingredients for success are 1) environment, 2) medium and 3) timing.

A proper environment is the most important ingredient, especially with stem cuttings. Moisture is the magic potion of the propagator. It must always be present. Success will never be achieved should the seed or cuttings dry out.

Medium and Timing

There are probably as many recipes for the medium in which to propagate as there are propagators. Here is one for seeds, another for cuttings. For tiny seeds, use a well mixed combination of equal parts sifted sphagnum peat moss, sifted garden loam (any soil that grows good tomatoes) and sharp builder's sand. Sifting is best accomplished with a ¼" mesh hardware cloth.

A standard medium for cuttings is equal parts horticultural perlite, sharp builder's sand and sifted sphagnum peat moss. Thoroughly mix all ingredients, place them in a wood or fiber flat, and apply water until it runs out of the bottom of the container. Do this at least twenty-four hours before use.

I sow nearly all of my rock garden seed in early to mid-winter out of doors. This provides a natural cold treatment, which the seeds of many species need. Germination begins in early March in my part of Pennsylvania (Delaware Valley). Of the 156 kinds of seed sown outdoors during one recent winter, 134 kinds germinated by June, with most of the rest germinating the following season. A few kinds take two or even three years to germinate.

The timing for cuttings is not so simple, and it is considerably more vital to success. Table 1 provides the basic rules and the best time for taking cuttings in our area.

From Seed

Most rock garden plants produce abundant but small seed. Therefore, three-inch square plastic pots are used for germination. Employ only plastic pots, which retain moisture better in summer than do clay or fiber pots. Begin by placing a piece of fiberglass screen-wire cut to the size of the inside bottom of the pot. Lightly place the medium into the pot, filling to the brim. Using a smaller size pot, gently tamp the medium until about ¼" rim of the pot is showing. Put fifteen to twenty seeds on the soil surface and cover them with fine stone chips (or poultry starter grit or aquarium grit) to a depth of about ⅛". This is now called a seed pan. Place it in a container of tepid water to a depth of about one half the seed pan and let the pan soak until all of the top grit is wet. Keep pan indoors for twenty-four hours, then move it to a seed frame outdoors, where it will be exposed to all of the elements (freezing, thawing, sun, rain, snow). Label each seed pan clearly with plant name and date.

Table 1	Timing					Root hormone			Type of cutting material		
Type of plant	April—May	June	July—Aug.	Sept.—Oct.	Dec.—Feb.	Rootone®	Rootone #10® or Hormodin #3®	Bottom heat at 70°	Current yr. growth (greenwood)	2—year-old growth (mature wood)	Side wound base of cutting
Herbaceous:											
Iberis	×								×		
Campanula		×							×		
Geranium		×							×		
Gentian		×							×		
Penstemon		×							×		
Chrysanthemum	×								×		
Androsace		×							×		
Arabis	×								×		
Silene		×							×		
Deciduous:											
Rhododendron		×							×		×
Azalea		×							×		×
Forsythia		×							×		
Cotoneaster		×							×		
Willow	×								×		×
Maple	×								×		×
Evergreens:											
Leucothoe			×			×			×		×
Pieris			×			×			×		×
Rhododendron			×			×			×	×	×
Azalea			×			×			×	×	×
Euonymus			×			×			×		
Cytisus			×			×			×		
Ilex				×			×		×		×
Conifers:											
Chamaecyparis					×		×	×	×	×	×
Cryptomeria					×		×	×	×	×	×
Juniper					×		×	×	×	×	×
Thuja					×		×	×	×	×	×

As the days lengthen in March, my wife and I find ourselves on bended knee near the seed frame in early evening, not paying strict religious homage as those looking our way would surmise, but exclaiming to each other as we discover the seed germination for the day. This ritual is followed by noting on a card the kind of plant, the date sown and the date of germination. The card is a great source of information for guiding us with similar seeds in future years.

The aftercare of germinated seed is important. Above all, do not let the seed pan dry out. Some of the seedlings (fortunately the minority) may be too small to transplant for at least a year. Allow them to dry out just once and you will be the possessor of dead seedlings. During the summer, daily watering is frequently required.

When the seedlings have produced their first true leaves and they are large enough to handle, tap the entire seed mass out of the pan by turning upside down and striking gently on a flat work surface. Should the pan of seedlings come out in a clump of tangled roots, drop the clump onto the work surface from about a foot in the air. This will disentangle the seedlings. Most rock garden plants produce tremendous root systems almost immediately upon germinating. In their mountain habitat the roots must go down through a great amount of stones and scree in order to reach sufficient moisture and nutrition to survive.

Using the same mixture as for seed sowing, fill a small plastic pot (2¼″) and poke a small hole into the medium with a lead pencil or little finger. Insert a seedling and tap the pot to discharge any air-pockets. Place in a pan of water and let soak for several hours. Top dress with stone chips (poultry developer grit or small creek bottom stones) to a depth of ¼″. Place these potted-up seedlings in a bright but not sunny location outdoors. During the first winter the transplanted seedlings should be kept in a coldframe to reduce desiccation. After, they will be sturdy enough to fend for themselves in a rock garden or can be used as barter with fellow gardeners.

By Cuttings

Have all of your materials ready before you take cuttings: rooting hormone, small container of water, four-mil polyethylene plastic sheet, wood or fiber flat filled with moist medium, labels, pencil and small

Gottscho-Schleisner

An herbaceous candidate for propagation, *Silene caroliniana* var. *pensylvania.*

Rex Murfitt

Cotoneaster microphyllus 'Cochleatus' is one of many low-growing broad-leaved evergreens which can be propagated by cuttings. It has white flowers followed by red berries.

watering can. Take cuttings in the morning when you are planning to work with herbaceous or greenwood cuttings. Turgidity is most important when taking hardwood cuttings. In winter, however, the parent plant frequently is not sufficiently thawed until mid-day.

With plastic sandwich bags and pruning shears in hand, proceed to the plant you wish to propagate. Selecting only side and nonflowering shoots or branches, prune from the parent several vigorous, healthy, disease- and insect-free pieces. Immediately place in a plastic bag and head for your work area. Using a pencil for a dibble, poke a small hole in the rooting medium. Strip a piece of plant material about 2″ long, remove the lower leaves, make a forty-five-degree cut with a very sharp knife or razor blade, and wound the side of the cutting by making a 1″ long, thin slice at the base. Insert the cutting into tepid water, then, for those plants requiring it, into the rooting hormone (see Table 1), and place into the hole in the rooting medium. Repeat this step for as many cuttings as you have. Keep them 1″ apart in a row in the flat. Label the row including plant name, source and date of cuttings, and gently water the entire flat until it runs out the bottom.

Place the flat in a large polyethylene bag. Plant stakes or improvised hoops should be plunged into the flat to keep the polyethylene from settling upon the leaves. Pierce a few holes in the bag to allow air circulation while maintaining a humid atmosphere. Set the bagged flat on four inverted 3″ pots in a bright but shaded place. A northern side of the house or garage will suffice. Don't let sunlight shine on the bagged flat or cuttings will bake.

Rooting should occur in six to eight weeks. Adding moisture during this period should not be necessary if the bag remains closed. At the six-week milestone, open the bag and gently tug on a few of the cuttings. If they resist, they are rooted. If not, reclose the bag and wait a couple of weeks and repeat the tugging. They should be rooted by then, if they are to root at all. Open the bag and, day by day for a week, gradually peel the bag away from the flat.

Keep the rooted cuttings in their same location and don't let them dry out. Once again, drying is fatal. In a month, place the rooted cuttings in 2¼ to 3″ plastic pots in the same kind of medium that was used for seed sowing. These freshly rooted and transplanted cuttings should be disbudded by removing the terminal bud with a fingernail. Further, their first winter should be spent in a cold frame because they won't have sufficient roots to sustain them and would succumb to desiccation. Don't forget to place a label in each and every pot with the name of the plant and the date the cutting was taken.

After the first winter these little plants can be lined out in a nursery row, but they must have partial shade from the summer sun the second year. After that, they should be perfectly happy set out in the rock garden or presented with confidence to friends in exchange for cuttings of some of their more choice plants.

Hardwood cuttings may be handled much the same way as described for the greenwood cuttings. However, before putting the rooting medium in the flat, place a 6 foot, 70° heating cable (obtainable from large seed houses) in the bottom of the flat. After the cuttings are set in the flat and the plastic bag has been pulled over it, place the flat on a bright but not sunny basement windowsill where the temperature is between 50° and 60°F. Plug in the heating cable and check every few weeks to be sure that the rooting medium does not dry out. Rooting should occur in eight weeks or so. Cuttings rooted in this fashion should be handled exactly as described for herbaceous and greenwood cuttings. However, they should not be placed outdoors until all danger of frost is past.

One may also propagate certain rock garden plants by budding, root cuttings, grafting or layering, but these are fairly specialized techniques which few gardeners will want to or need to employ. These methods are treated well in numerous publications including BBG Handbook #25, *Propagation*. Check your library for further readings on the subject, which is one of the most rewarding in horticulture. ⁂

W. M. Flook

Pasque flower (*Anemone pulsatilla*)

If you have the right conditions try these . . .

CHOICE PLANTS FOR THE SUNNY ROCK GARDEN

Marnie Flook

with assistance from Thomas Buchter

Most rock plants are essentially sun worshippers and need strong light during the better part of the day to bloom well and remain thrifty. However, the warmer the climate is, the more beneficial afternoon shade is, for the sun can sear foliage, shorten blooming time and make flower color harsh. The majority of plants on this list are not averse to light shade in the mid-Atlantic states during the hottest time of day. For true shade lovers see pages 29-35.

The culture of plants depends in good part on where they come from in the wild. Plants from mountain slopes require perfect drainage in grit and stone. The only "fertilizer" there is is the humus of their own dead leaves. Their water comes from melting snow. Plants from the plains need sunny, dry conditions. If they are from the woods, they will likely thrive in humus-rich soil and at least part shade. For the greatest success grow plants which seem to fit the natural conditions of your garden.

Achillea tomentosa, woolly yarrow, from the dry slopes of Europe and western Asia, makes a creeping mat of gray-green, finely dissected leaves. Plants may need curbing from time to time but make a good ground cover in a restricted site. Flat clusters of yellow flowers appear on 12″ stalks in early summer. Lean sandy soil is essential because achilleas are susceptible to a fungus in hot muggy weather.

Aethionema* x *warleyense (*A.* 'Warley

Rose'), known as Persian-candytuft, is a hybrid of two species that grow on cliffs in Turkey, Iraq and Iran. It has narrow steel-blue evergreen leaves with deep pink flowers in spring. A compact shrub-like plant preferring gritty limy soil, it is best grown in a wall where it stays dry. May need winter cover in the North.

Androsace sarmentosa, a member of the Primrose Family from the Himalayas, has evergreen leaves in woolly rosettes with pink flowers on stems 4-6″ high in May. These rosettes are stoloniferous and the plant sometimes spreads too vigorously, though excess growth is easy to uproot. A smaller, less spreading version is *A. sempervivoides* with shiny rosettes and pink flowers on stems 4″ high. Plants will be most compact in gravel in sun but can be grown well on a semi-shaded slope.

Anemone pulsatilla (*Pulsatilla vulgaris*), the pasque flower from Europe, has more than one season of interest. The rosette of furry leaves emerges in early spring bearing deep purple flowers on stems which gradually elongate as the flowers mature. The attractive feathery seed heads borne on 12″ stalks last for a long time. Seeds are short-lived and should be planted immediately. Mature plants do not transplant easily because of their long thonglike roots.

Aquilegia, columbine, has many species which intermix and produce hybrids. The following come true from seed. *A. canadensis*, the wild columbine of the East, has lacy leaves and long-spurred red-yellow flowers on 6-24″ high stalks in spring. It prefers rocky soils in sun to half-sun. Since it is short-lived allow it to self-sow. The Japanese fan columbine, *A. flabellata* 'Nana Alba', has fleshy, glaucous leaves and short-spurred, pure white flowers 12″ high in spring. Like other columbines, it is prone to leaf miners but they can be controlled by spraying with malathion a few times in spring. *A. flabellata* var. *pumila* (*A. akitensis*) is the blue and white form. Only 4″ high is the Colorado columbine, *A. saximontana*, with pale blue and yellow flowers over finely cut leaves.

Of the 100 species of ***Arabis***, rock cress, the best known is *A. alpina* from the mountains of Europe, though what is grown in gardens may be mostly *A. caucasica*. Its spreading mats of gray spoon-shaped leaves and loose racemes of white or occasionally pink flowers grow best in a lean gritty soil in sun or in a wall. For rejuvenation, plants must be well pruned back after flowering. Very colorful, but because of its spreading habit arabis should not be placed near small treasures in your garden. Not as well known is *A. sturii*, which makes a mat of bright shining leaves with white flowers 4″ high. It has a completely different appearance.

Arenaria montana, mountain sandwort, a beautiful plant from Portugal, Spain and France, has long trailing stems with narrow leaves which form a carpet in spring. They are covered with large white cup-shaped flowers that have a yellow eye. A plant looks well draped over a rock. Often short-lived. Since mountain sandwort does not root easily or divide well, it is best propagated by seed.

Armeria juniperifolia (*A. caespitosa*), juniper thrift, from the mountains of Spain, makes a rosette of stiff, needlelike evergreen leaves with tight flower clusters of pink or white on sturdy stems. The rosettes which come from a single taproot form clumps which tend to die out in the center; these can be renewed by top-dressing with gritty soil and chips. Grow in rocky soil or in a crevice.

Aster alpinus is an early-summer bloomer with large violet daisies on 12″ stems. Rocky soil and division after flowering may make it longer-lived. Good cultivars include 'Bleekwood', with lavender-blue flowers.

Aubrieta deltoidea, from Sicily, Greece and Asia Minor, is similar to *Arabis* but has lavender or purple flowers. It performs best in stony, limy soil and is a good wall or crevice plant. Cut back after flowering. It is as common in England as *Phlox subulata* is in the United States.

Aurinia saxatilis (*Alyssum saxatile*), the well known basket-of-gold, grows on limestone cliffs in Europe and Turkey. Its long gray-green leaves form a spreading mat with bright yellow or pale yellow ('Citrina') flowers 12″ high in spring. A good wall plant. Prune severely following bloom.

Roche

Geranium sanguineum var. *prostratum* (*G. lancastriense* of the trade) produces pink, red-veined flowers over a long period during the summer.

Campanula, the bellflower genus, includes three hundred species, many of which are good rock garden plants. *C. carpatica* grows upright to 12″ and has blue or white flowers. *C. elatines* var. *garganica* from the Adriatic is a basal tuffet with starlike blooms. In a wall the leaves splay out in a circle. *C. poscharskyana* is similar but more robust than *C. elatines.* A free seeder, it is best in a wall where it can be contained. *C. portenschlagiana* (*C. muralis*), from northern Yugoslavia, makes a compact tuft of dark green, shiny leaves with upfacing bells. Light shade is probably best. *C. cochlearifolia,* from the mountains of Europe, makes tiny rosettes of foliage with small, light blue or white bells on thin wiry stems in summer. Don't let the plant dry out.

Dianthus, pinks. Many are good rock garden plants. In bloom in June are *D. alpinus* and *D. pavonius (D. neglectus)* with mats of grass-green, short broad foliage and large rounded flat blossoms of rose-pink. The flowers of the first are flecked in the center with a ring of crimson. The second has a dusky blue eye and is buff on the back of the petals. Both grow 2-6″ high. A well drained, limy soil with good light but not full sun is satisfactory. Seeds do not always come true. Hybrids of sun-loving *D. gratianopolitanus* such as 'Tiny Rubies' and 'Little Joe' with tiny blue-green leaves and many small flowers are usually available in garden centers. They are easier to grow than the species.

Draba. Some of the earliest-blooming plants in the garden are the drabas from the mountains of south and central Europe. *D. aizoides* and *D. rigida* form tight little evergreen mounds, whereas *D. sibirica* has a trailing, spreading habit. Bright yellow mustard-like flowers appear in April. They should be near the house so they won't be missed. Especially nice is the white-flowered *D. dedeana* from Spain. Give these plants a light gritty soil.

***Festuca ovina* var. *glauca*,** blue fescue, is a clump-forming ornamental grass from Europe which grows 8″ high. The blue-green foliage helps tone down strong colors that may be nearby. Useful as an accent plant, and most attractive in late summer when the seed heads turn buff. Divide every several years to keep thrifty.

***Gentiana*.** Opening in spring, the beautiful blue trumpets of *G. acaulis* from the Alps and Pyrenees are familiar alpine flowers. A rich moist soil on a north slope with plenty of light suits this evergreen mat-former. In summer *G. septemfida* from western Asia produces blue flowers at the end of long stems. In autumn *G. scabra* from north China makes a handsome plant with many blue trumpets above a dark green mat of leaves. These last two plants die back to a few growing buds during the winter.

Geranium sanguineum* var. *prostratum (*G. lancastriense*), the Lancaster geranium, is not as large and spreading a plant as *G. sanguineum*. The mound of long trailing stems with pointed five-lobed leaves produces soft pink, red-veined flowers most of the summer. *G. sanguineum* itself has strong red-purple flowers and should be planted with discretion. Fall leaf color is attractive so don't cut the stems back until late in the year. *G. dalmaticum*, from the Dalmatian Peninsula, has small shiny leaves and rose colored flowers in summer. A dense, compact grower, it makes an unusual ground cover for a very small area. There is a white-flowered variant.

***Globularia cordifolia*,** a native of southern Europe, makes an unusual ground cover for bulbs. In May small heads of fluffy blue flowers rise 4-5″ above a mat of dark leathery leaves, which are evergreen.

Gypsophila repens is a fast-spreading plant from the mountains of Spain. It has an airy quality with pink or white flowers much like a tiny baby's-breath, which it is. *G. cerastioides*, from Kashmir, the Himalayas and Sikkim, is a little harder to grow. Its white flowers veined in purple appear in spring above a thick mat of one-inch long spoonshaped leaves. An open north slope and acid soil are best for this attractive little plant, which is not dependably hardy in the colder regions.

***Hedyotis* (*Houstonia*) *caerulea*,** the native bluets or Quaker-ladies found in meadows, might not be considered for the rock garden, but the clumps of tiny leaves and small light-blue flowers make it an ideal candidate. Extra moisture in spring and division of older clumps is suggested.

Hutchinsia alpina comes from the mountains of central and southern

Photos by Roche

Gypsophila cerastioides, a Himalayan relative of baby's-breath, may need winter protection.

Hedyotis (Houstonia) caerulea, the familiar Quaker-ladies, is a happy addition to the spring rock garden.

Europe. It is a plant with ferny dark-green foliage and small white flowers like a miniature candytuft. Given light shade and moist soil, it will form good-sized clumps (8″) and bloom for a long time in spring and summer. A few flowers may appear at any season.

Iberis sempervirens, also from Europe, is the familiar perennial candytuft. Its white flowers and narrow evergreen leaves look especially handsome growing in a rock wall. The plant should be cut back severely after bloom in spring. Two named selections are 'Little Gem' and 'Snowflake', the latter of which often has a second bloom.

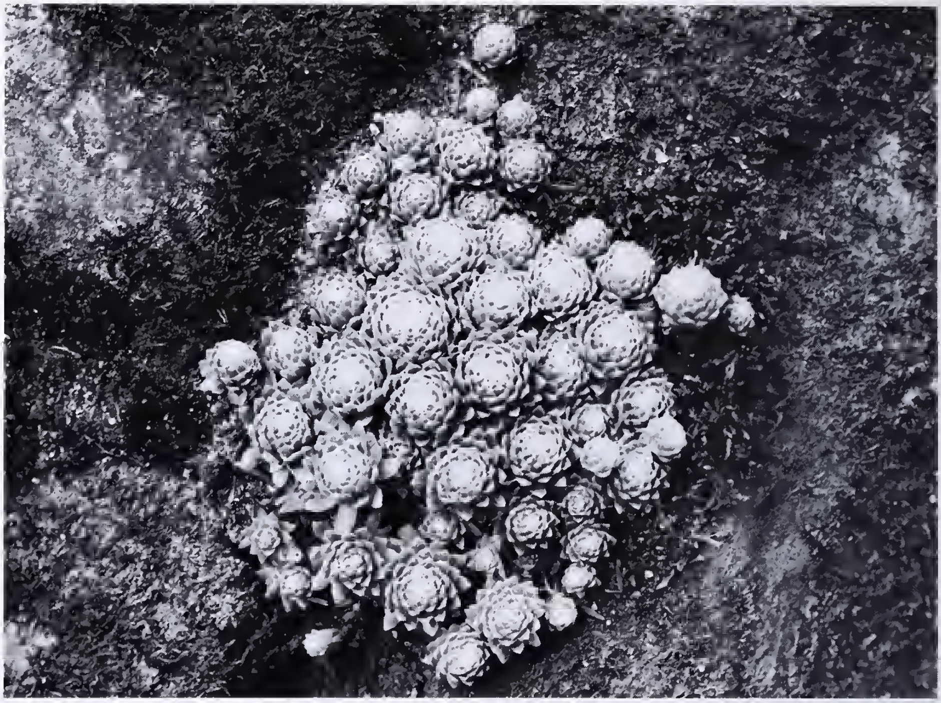
Iris pumila, native from central Europe to Asia Minor, ranges in color from white to yellow and lavender. There are many cultivars. The usual height is 8″, and flowering is earlier than the tall bearded sorts which it resembles. Provide good drainage.

Lewisia cotyledon is a succulent from the mountains of northern California and southern Oregon. The thick brittle evergreen leaves form large rosettes, and the heavy fleshy roots extend several feet back into the rocks. Place this plant so moisture won't get into the crown. A shaded crevice in a rock wall or gritty acid soil on a north-facing slope works best. The beautiful flowers in shades of pink appear on 8-10″ stems in spring. Harder to grow than most but worth the effort if you have the right spot.

Papaver nudicaule and ***P. radicatum,*** two alpine poppies with much-divided silvery leaves, have lovely silky flowers in orange, pink, yellow and white. They are short-lived and difficult to transplant. Plant seeds directly in the garden in moist gravelly soil, and save a few each year to start new plants.

Penstemon. Most of the species are from the American West. *P. davidsonii* forms an evergreen mat with deep purple-blue tubular flowers blooming a few inches above the leaves. Having similar flowers but taller and dying to the ground each winter is *P. glaber. P. hirsutus* 'Pygmaeus' is probably the most reliable penstemon. It is evergreen, about 4″ high, with lavender flowers in summer. *P. pinifolius* is very different, a spreading plant with small scarlet flowers and needlelike leaves. Give all the penstemons well-drained, gravelly soil.

Phlox subulata, the moss-pink of the eastern United States, is most often seen in gardens in a harsh magenta-pink color. Easier to use in the landscape and more attractive are the many named cultivars in shades of blue, white and red. The prickly needlelike foliage is evergreen and forms roots along the stems. A good ground cover in a limited area, but perhaps too much of a spreader for the small rock



Photos by Roche

Sempervivum arachnoideum make a tight cluster of glaucous green plants that appear to have little spider webs on the leaves

garden. 'Schneewitchen' is a more compact cultivar with small white flowers.

Potentilla, the cinquefoil genus of the Rose Family, has over five hundred species. *P. alba* from Europe and the Caucasus, has silky, five-parted leaves, which are almost evergreen. The large white flowers bloom through the season. *P. tridentata,* found in Greenland and in much of the eastern United States, has shiny evergreen, three-parted leaves which form mats. It has small white flowers in summer. Brilliant red fall foliage adds to the value of this plant, which is also a good ground cover in combination with bulbs in small areas. Probably the most familiar potentilla is the small green cushion of *P. verna* 'Nana' of the trade, which has golden yellow flowers in spring. Potentillas perform best in full sun, an exception being *P.* x *tonguei,* a trailer with soft apricot-colored flowers much of the summer, which benefits from light shade. A few species are low shrubs, including *P. fruticosa,* the one most frequently grown. In cool northern regions its yellow flowers may appear intermittently through summer.

Saponaria ocymoides, one of the soapworts, is a reliable wall plant from Europe. Its clusters of pink flowers appear on long stems in early summer. Since this plant has a sprawling manner it should be cut back after the flowers fade.

Saxifraga paniculata (*S. aizoon*) has rosettes of silvery leaves with encrustations of lime along the edges. Long sprays of white flowers emerge from the rosettes in spring. Although plants resemble sempervivums, they perform best in half shade in crevices with rocky limy soil. There are many hybrids of encrusted saxifragas which do well in the rock garden. The mossy and Kabschia saxifragas are more difficult to grow.

Schivereckia podolica, from Europe, has narrow gray-green leaves and small white alyssum-like flowers on 4″ stems. It blooms early in spring.

Sedum. Many of the stonecrops are good rock plants able to cope with difficult conditions. However, some can become invasive. An excellent, well-behaved little one is *S. dasyphyllum*, which makes a mat of gray-blue leaves. It bears pink flowers on short stems in summer. *S. sieboldii*, from Japan, is a welcome sight in a wall because of its arching stems and pink flowers which appear in autumn. *S. kamtschaticum* var. *middendorfianum* has yellow flowers in summer. When out of bloom it resembles an *Iberis* because of its linear leaves.

***Sempervivum*,** the genus of hens-and-chicks. These are true alpines, growing in crevices and rocks in high mountains of Europe and the Middle East, but they are of unusually easy culture. They look best when grown among rocks. Their texture, form and color rather than their flowers are what makes them so attractive. *S. arachnoideum*, one of the smaller kinds, has little gray threads crossing the rosettes like a cobweb. Many sempervivum hybrids are available. They all take lean, dry soil. After a rosette sends out its stalk of pink flowers it will die, but many others (the "chicks") keep the plant going.

***Thymus pseudolanuginosus*,** woolly thyme, is a perfect plant for pavements and joints in walks. It is a carpeter with small gray foliage and pink-to-lavender flowers in summer. It spreads well and should not be allowed near tiny treasures. The same is true of mother-of-thyme (*T. serpyllum* of the trade), which romps.

Veronica prostrata makes a thick round clump of prostrate stems with dark green leaves and clusters of blue or pink flowers in early summer. There are other good low-growing species, mostly of vigorous constitution, but avoid *V. filiformis*, which escapes easily into lawns.

***Viola pedata*,** bird's-foot violet, keeps to one place more than most other violets do. This native of the eastern United States is a lovely plant with divided leaves and lilac violet flowers. It blooms in spring. Rocky sandy soil works best. ⁂

A larger sempervivum *(S. tectorum)* has more open foliage than the one above left. Both are easy to grow and look best growing on rocks.

QUESTIONS AND ANSWERS

Betty Ann Mech

What is a rock garden plant? My neighbors have a rock garden which they plant every year with portulaca and other annuals. The plants in this Handbook look different.

Experienced rock gardeners mainly grow perennials, ones that mature at less than one foot in height. (A few carefully selected annuals may have a place, too. See page 46.) Your neighbors' garden, with just annuals planted among the stones, is called a rockery. True rock garden plants grow slowly and compactly, forming larger specimens each year.

Why are rock plants so small? Where did they originate?

Rock gardening, or alpine gardening as it is known in other countries, originated over 100 years ago when people began to appreciate the flora of the Alps where tiny plants grow in close association with rocks. Through the years, the classification has broadened to include miniature plants from all the harsh places of the world—desert, tundra, cliff and bog. Just as the cold wind at the mountain summits limits the size and flowering season of the plants that grow there, other climatic and soil conditions in various environments keep plants small, leading to the development of intriguing forms.

Do I have to have rocks? I like rock plants because they have such neat growth and are covered with flowers, but I weigh only ninety pounds and can't lift much weight.

It isn't necessary. Some rock plants can be set at the front of borders, and vigorous ones can be used as ground covers. However, rocks are beneficial artistically because many plants look their best in contrast with them. They also offer shelter from sun and wind and preserve moisture in the soil.

Do not try to lift big rocks. Fair-sized ones can be moved by rolling them on canvas, using a heavy bar to nudge them into place.

I want to make a rock garden, but how do I start?

Pick a site that has well drained soil, preferably at least half a day of sun and where rain falls naturally. Remove all vegetation and shape the soil, adding more soil if necessary. Rocks are placed next; flat stratified ones arranged in horizontal layers that tip slightly back into the soil, irregular rocks and boulders nearly half-buried so they are stable and look natural. Vary the sizes and distances of rocks from one another to avoid the "graveyard" look.

Backbone plants go in next, dwarf conifers and miniature shrubs first—with an eye to their future growth—and the low-growing flowering perennials last. Soak the new garden well and make sure roots are covered. The final step is to mulch the entire bed with gravel that is similar to the garden's rock. A gravel mulch discourages weeds, keeps in moisture and protects the crowns of plants from rotting.

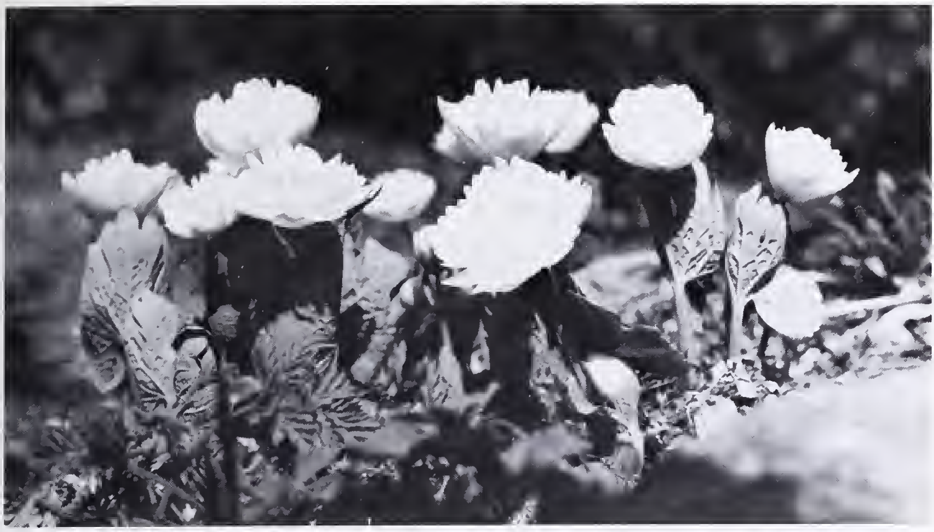
I want to start a rock garden right away, but where can I get good plants?

Your first stop might well be the library to read about and see pictures of typical rock plants—then you will have a better idea of what you are seeking. Visit botanic gardens to see how a plant really looks. Local nurseries sometimes stock dwarf perennials and suitable ground covers. Mail-order nurseries specializing in rock plants have the widest variety. The major seed houses have sections in their catalogs devoted to rock plants.

One of the most pleasant ways to accumulate plants and information about growing them is to join the American Rock Garden Society. The nursery advertisements in the back of the *Bulletin* are a help on plant sources, too.

What are some plants that are easily grown from seed?

Arabis, Aurinia (Alyssum), *Aquilegia, Aster alpinus, Campanula carpatica, Dianthus* and *Primula.* See page 16. ❧



W. M. Flook

Double bloodroot (*Sanguinaria canadensis* 'Multiplex')

Don't let the lack of sun keep you from . . .

ROCK GARDENING IN THE SHADE

Richard W. Redfield

When we think of gardening in the shade, the first plants that come to mind are the native woodlanders. These certainly will form the backbone of any shaded rock garden. Nevertheless, there are many plants from other lands that will perform equally well under such conditions. The only thing we ask of a plant is that it must look appropriate in the setting and blend in with its neighbors.

Among the best of the natives are the trilliums. Of these, *T. grandiflorum* is perhaps the showiest and the easiest to grow. This species appears to do best in a rich, neutral, woodland soil, but it also tolerates more acid conditions. When well established, it self-sows freely. A few tubers planted in our eastern Connecticut woodland twenty-five years ago have increased to several hundred plants by self-sowing.

The double-flowered form, *Trillium grandiflorum* 'Flore Pleno', is truly spectacular. It cannot be grown from seed, but individual plants form clumps and, when they have become multiple-stemmed, can be divided. In our experience, the best time to do this is in late summer, just before plants go dormant. Other species that have proved relatively easy to grow are *T. erectum*, with velvety dark red flowers, *T. hugeri* and *T. luteum*. The latter two have attractive mottled foliage.

Another beautiful and easy-to-grow native is bloodroot (*Sanguinaria canadensis*). A fairly common plant in New England, it seems to be at its best at the edge of woods or along roadsides where shade is not too dense. There is also a striking double-flowered form, 'Multiplex', which is just as easy to grow as the type. Like the double trillium, it must be increased by division.

Twinleaf (*Jeffersonia diphylla*) is a common native in West Virginia that thrives equally in northeastern gardens. The rather small white flowers are of short duration, opening before the leaves are fully expanded, but the plant remains attractive for a long period because of the kidneyshaped segments of the foliage. The Japanese species, *J. dubia,* has a much more beautiful flower, twice as large and a lovely shade of lavender, reminiscent of some of the hepaticas. Seed of both species is somewhat reluctant to germinate when treated by usual methods, but when plants are well established in the garden they self-sow freely.

Among dwarf iris, the crested (*I. cristata*) is the easiest to grow and is a most desirable plant for the woodland. The flowers come in various shades of blue and also pure white. Very similar, but on a smaller scale, is *I. lacustris.* This species seems to require more light. The wonderfully fragrant *I. verna* has been a bit more difficult, requiring an acid, sandy soil, with considerably more light, in order to bloom freely.

The woodland phloxes make excellent, colorful ground covers and can be striking in spring bloom. *P. stolonifera,* in several color forms including the beautiful albino, has proven the best for us. Cultivars include 'Pink Ridge' and 'Blue Ridge'. The somewhat taller blue phlox (*P. divaricata*) is also desirable.

Most of the colorful astilbe hybrids are too tall for rock gardens, but several dwarf species are quite satisfactory. *A. chinensis pumila* is a robust spreader, with attractive mats of low ferny foliage and 8-10″ tall spikes of deep pink flowers in the latter part of summer. *A. simplicifolia* and *A. glaberrima saxatilis,* from Japan, are attractive, refined little plants with pale pink flowers, which appear earlier. When grown together they hybridize, and the resulting plants are similar to *A. glaberrima saxatilis* but more robust. Probably the best of all is *A. crispa,* apparently of hybrid origin. As the name indicates, this one has very stiff foliage and is truly dwarf. All of the astilbes prefer a location that does not become parched.

Among evergreen plants, two of the best are *Galax urceolata* (*aphylla*) and *Shortia galacifolia,* with similar foliage but with seemingly unlike flowers. (Galax and shortia are both members of the Diapensiaceae.) Both are attractive year round, the leaves assuming reddish tints in fall. Galax, with flower stalks 2½′ tall in late spring or early summer, is easier to grow and spreads more quickly, but the flowers of shortia, sometimes called Oconee bells, are more beautiful and worth extra effort.

The evergreen wild gingers are also worthwhile plants. The European species, *Asarum europaeum,* has leathery, dark green leaves and is a moderately rapid spreader that can be used as a ground cover in dense shade. Among the natives, *A. virginicum* and *A. shuttleworthii,* both southern but hardy in the North, are the most likely to be available. *A. shuttleworthii* has attractive mottled leaves. Both are somewhat slower in growth than *A. europaeum.* The wild gingers have inconspicuous, brownish, urn-shaped flowers that are interesting rather than beautiful, which appear at the base of the plant.

Mostly from Other Lands

All of the epimediums are good, reliable plants for the shady garden, even in relatively dry shade. The "bishop-hat" flowers of the various species and hybrids vary in size and range through yellow, white, lilac and rose. One hybrid, *E.* x *warleyense,* has orange flowers. The related West Coast native, *Vancouveria hexandra,* is very similar in appearance and growth habit. Despite the mild climate of its native habitat it is hardy in cold northeastern gardens and spreads freely once established. Even after the flowers of all of these plants are finished, the foliage remains an important feature of the garden all summer.

To most Americans the name meadow-rue brings to mind a very tall plant with fernlike foliage and feathery white flowers, but there are at least two members of this genus, *Thalictrum kiusianum* and *T. coreanum,* from Japan and Korea, that are truly dwarf and completely at home in the shady rock garden. They have dainty purple flowers (*T. coreanum* tending to a pale rose shade) in late spring or early summer and grow only a few inches tall.

The majority of hostas are also too robust for any but large rock gardens, but

W. M. Flook

The lavender flowers of *Jeffersonia dubia* are followed by interesting seed capsules and long-lasting kidneyshaped foliage.

there are a number of diminutive kinds for small gardens. *H. venusta* and *H. tardiflora* are two excellent ones. The former has pale purple flowers in summer. The latter is especially choice, with dense spikes of lavender flowers above glossy dark green foliage. It blooms in the fall when little else in the garden is in flower.

No rock garden should be without at least a few primroses. *Primula sieboldii* is the easiest to grow and is one of the few species that tolerates a fairly dry situation. There are various forms with flowers ranging from pure white through shades of lavender and pink to near-red. Some have flowers so finely divided that they resemble snowflakes. If you have a wet location, try *P. japonica*, one of the candelabra group. Although rather tall to be considered a rock garden plant, it makes a great show in late May and early June. We have planted large numbers of them beside a small stream in true swamp conditions with skunk-cabbage (*Symplocarpus foetidus*) and other native plants for companions. The Japanese primroses are thriving and multiplying, and really look very much at home among the natives.

Generally, the little bulbs suitable for rock gardens are sun lovers, but there are a number that tolerate shadier conditions. One of the best is the spring snowflake (*Leucojum vernum*). This species seems to prefer a rather moist location. It is thriving in our Connecticut garden near a small stream, just above the level where *Primula japonica* is planted. The individual clumps are increasing and we are also getting self-sown seedlings. The larger clumps can be readily divided after blooming.

Although not a bulb, the European wood anemone (*A. nemorosa*) is often listed in bulb catalogues and is an excellent plant for the shady garden. Several named forms, in various shades of blue, are available and there is a lovely pure white form with a crested center, somewhat resembling a tiny collarette dahlia. The related American native, rue-anemone (*Anemonella thalictroides*), is another good plant for similar locations. The typical form has clusters of single white or pale pink flowers but there is a striking double pink form, available from some rock garden specialists as 'Oscar Schoaff' or 'Schoaff's Double Pink'.

There are many other plants suitable for the shady rock garden, but all of those described have been grown successfully over a period of years in our two locations, first in northeastern New Jersey and then in eastern Connecticut, and we can heartily recommend all of them. ❧

No need to lament—here are . . .

A FEW MORE FOR THE SHADE

Erica Greenfield

Into each garden a little shade must fall, unless you live on the plains, desert or mountain top. City dwellers know the problem well, as do suburbanites in older communities where Norway maples, planted years ago, have come to somber maturity. As often as not, the limiting factor for good growth of rock garden plants is the root competition posed by the shade-tree giants. For a full treatment of the subject see BBG Handbook #61, *Gardening in the Shade*, guest edited by Harold Epstein, President Emeritus of the American Rock Garden Society.

Mostly from America

Want a little yellow daisy that will bloom in light shade the better part of summer? Then seek out *Chrysogonum virginianum*, which southerners know as green-and-gold and people from other parts of the country call golden-star. The form commonly in the trade is a prostrate, somewhat coarse-leaved, mat which with a little encouragement becomes a ground cover in due course; another form is a compact upright grower that keeps to its station. The plant is dependably hardy to coastal New England but can be grown in colder areas if protected by boughs in winter. A slightly taller plant of the same order but with more orange to the flower is *Coreopsis auriculata* 'Nana'. It cavorts well in a shaded corner with fire pink

Roche

Green-and-gold or golden-star *(Chrysogonum virginianum)* can grow into a very attractive ground cover for light shade.

Eastern bleeding heart *(Dicentra eximia)* blooms freely over a long period.

(*Silene virginica*), an early-summer wildflower with scarlet bloom. Both plants are jump-abouts, and the fire pink is short-lived, so let it reseed.

Eastern bleeding heart (*Dicentra eximia*) has gray-green fernlike leaves that are attractive through the season. So are the small, deep pink flowers. A handsome white-flowered variant will sometimes appear among the seedlings, which are produced freely. *D. formosa* 'Sweetheart', from the Northwest, is similar and has white flowers 18" high. Two other cultivars, *D.* 'Bountiful' and 'Luxuriant', have deep pink flowers over a long period. Both reseed generously, which is a mixed blessing in a small woodland area. These rockgarden dicentras should not be confused with the big old-fashioned bleeding heart (*D. spectabilis*), a beautiful plant in its own right.

Are you fond of flowers that resemble bleeding heart and Dutchman's breeches? Botanically, they are called fumitories, and one of the most delightful of them is *Corydalis lutea*. It is a low grower with finely cut, soft blue-green foliage and spikes of tiny yellow flowers most of the growing season. This plant performs best on rocky sites and walls in light or heavy shade. It reseeds freely, but the seedlings do not transplant with ease. Best sown in rock crevices. Try it in a stone wall.

Foamflower (*Tiarella cordifolia*) is a wonderful woodland plant with small maplelike leaves and fluffy white flowers in May, but it is usually stoloniferous and spreads too rapidly in the rock garden. A better choice for a small area in the shade is a southern species, *T. wherryi*, which does not jump around from the root. The flowers are also a bit showier and the foliage sometimes has a maroon mark in the center. Botanists are not of one mind concerning the number of species there are of *Tiarella* (one man's species is another man's variety), but there is no

W. M. Flook

A handsome clump of foam flower (*Tiarella cordifolia*) grown from seed. This one is atypical because it does not spread from the root.

disagreement about the horticultural worth of these plants.

Primula sieboldii, along with *P. japonica*, has already been mentioned in Richard Redfield's article (page 29) as the easiest primrose to grow. Its flower color is frequently a strong pink that needs toning down. If you have a lightly shaded area, plant it with blue phlox (*P. divaricata*) and the two will complement each other nicely. It also helps to remember that there are white-flowered variants of *Primula sieboldii* and *Phlox divaricata*, for they are useful in "sanitizing" strong nearby colors. Other primulas that should be considered for the shady rock garden are the familiar polyanthus in its array of colors (*P.* x *polyantha*), *P. frondosa*, *P. vulgaris* (*acaulis*) and *P. juliae* hybrids. Explore them and others. Nature did not make a bad primrose.

Shooting-star (*Dodecatheon meadia*) is so highly regarded that the American Rock Garden Society has chosen the flower as its symbol. It is native to moist woods and meadows of the interior United States, and some beautiful little related species are found in the western mountains. Shooting-star has a large rosette of leaves and narrow stems a foot or more tall, on top of which there is an umbel of cyclamenlike flowers in pink, lavender or white. Try a few plants in your garden.

There are many native American woodland plants that have a place in the shaded rock garden—hepatica (*H. americana*), bluebell or Virginia cowslip (*Mertensia virginica*), partridge-berry (*Mitchella repens*), wintergreen (*Gaultheria procumbens*) and Jacob's-ladder (*Polemonium reptans*), to name a very few. Get to know them and expand your horticultural horizon.

Ferns

The delicate textures, varying shades of green and the shape of their fronds make ferns an attractive addition to the garden. Most ferns grow best in shady woodsy areas, but others do well in rocky crevices in shade or sun. Maidenhair fern (*Adiantum pedatum*) has shiny black stems and lacy foliage; it looks well with primroses, anemones and astilbes. In a shaded corner where the soil has been enriched with humus, plant it behind European wild ginger (*Asarum europaeum*) for a superb foliage contrast all season long.

Two small ferns for shade and rocks are ebony spleenwort (*Asplenium platyneuron*) and maidenhair spleenwort (*A. trichomanes*), which is more delicate, living on moist, limy rocks. *Ceterach officinarum*, the rustyback fern, grows in limestone crevices in Europe; it is an evergreen fern with short leathery leaves and does well in half-shaded rocky gardens. Japanese painted fern, a striking variegated fern which has been grown under various names, most recently *Athyrium nipponicum* 'Pictum', has value in a larger shaded area for the effect of light it conveys. From the distance this fern gives a flowering appearance all summer. It is slow to rise in spring so don't weed it out by mistake.

Rock polypody (*Polypodium virginianum*) is a shade-loving fern found on rocks and logs in woodsy soil. *Woodsia obtusa* grows in more neutral soil in partial shade. There are many other ferns which will go well with spring bulbs and wild flowers or will help soften a rocky outcrop. Read the BBG *Handbook on Ferns* (#59 in the series) and F. Gordon Foster's article, "Ferns for the Rock Garden," in *Plants and Gardens*, Vol. 34, No. 4 (Winter 1978-79).

Briefly, then, there is little reason to complain about having too shaded a place for a rock garden, that is, unless you have your heart set on basket-of-gold. The plants you select will be different from those you would for a sunny area, but there are countless opportunities. Take advantage of them. ⁂

THE RECOVERY ROOM

Boyd Kline

The deep sand bed is ideal for the convalescence of plants sent to you by mail or larger ones which have been moved from a distant garden. We use beds 8-10″ deep, coarse sand that won't pack, and a shade cloth placed over the bed at 8′ height. It gives 63% shade. Plants moved in our hot Oregon summer are in shock the minute they are lifted and must be given special treatment. They are put into the sand, which is kept moist at all times, and then watered in well. Another shade cloth is draped on a support a foot or two above the plant for a week or ten days before removal, depending on the weather, after which only the upper cloth keeps the plants shaded. A plant can be left until autumn, by which time it should have formed a good bunch of feeder roots and can more readily fend for itself. If moved to the rock garden it again should be shaded for a few days.

Tempermental cuttings that have recently been rooted love this treatment, as do some finicky seedlings. Some of our western plants (e.g., *Silene, Epilobium*) require extremely good drainage and we give them a permanent home in these beds to make mother plants for seed and cuttings. ⁂

Gottscho-Schleisner

A selection of fine small . . .

BULBS FOR THE ROCK GARDEN

Pamela Harper

There is a tremendous range of miniature bulbous plants. Reducing the list to manageable size was a difficult task. Because most rock gardens are quite small, only those bulbs which usually do not exceed one foot in height are included. Bulbs impossible to find, or nearly impossible to grow, were next eliminated. Those remaining will grow (subject to limitations mentioned) in any fertile, porous garden soil. If improvement in the texture or fertility of the soil is desirable, a suitable planting mix might consist of two-thirds sieved leafmold or compost with one-

Opposite, a pleasing variety of textures in a lightly shaded spot. The spring bloomers include crested iris, "summer" snowflake, bergenia and one of the cresses. *Euphorbia epithymoides*, with chartreuse bracts, is dominant.

third coarse sand or fine grit. The addition of bonemeal is a time-honored custom, and certainly it does no harm. Manures and nitrogenous fertilizers are best avoided. Most bulbs adapt to sun or part shade, but if shade is desirable or essential this is indicated. The word "bulb" has been loosely interpreted to include corms, tubers and rhizomes.

How deeply to plant a bulb puzzles many gardeners. A planting hole three times the depth of the bulb is a basic guide, but depth is rarely critical, for most bulbs find their own level. Remember that you are planting, not interring them—better too shallow than too deep. If your garden is sandy, you probably share it (unwillingly) with moles. Bulbs tunnelled under may drop down too far to find their way out to the light again. Planting groups of the smaller bulbs in plastic berry boxes helps to prevent this or, on a larger scale, you can line the planting hole with hardware cloth and cover it (just below the soil) with chicken wire, through which the bulbs will grow but squirrels cannot dig. If you are plagued by moles, squirrels, mice, chipmunks or rabbits, crocus will suffer most and might best be omitted.

Bulbs are usually shipped, dormant, in autumn. If you know of a nursery willing to ship growing plants in spring, then buy snowdrops and aconites (*Eranthis*) at that time, but not from overseas, because the trauma of the journey (with packing kept to a minimum because of high airmail cost) offsets any advantage. Plant *Rhodohypoxis* in early spring, just as growth begins. Specialist growers ship freshly lifted cyclamen at a time of year appropriate to the species.

There is little information on the hardiness of dwarf bulbs. Where a hardiness zone is shown, this is taken from *Wyman's Garden Encyclopedia* and is based on the Arnold Arboretum zone map.

Allium. Ornamental onion. The following three species are among the best of the dwarf alliums. None has a pronounced onion smell unless the leaves are crushed. *A. narcissiflorum*. Swan-necked clusters of 3/4″ rosy bells in a papery sheath, strapshaped leaves. Rhizomatous roots often in poor condition when sold bare of soil, so best grown from seed. 9″. Early summer. (7). *A. senescens* var. *glaucum*. Swirls of gray-green leaves close to the ground, pale mauvish-pink drumstick flowers. Height variable, averaging 6″. Late summer/autumn. (3). *A. cyaneum*. Tussocks of linear leaves, loose clusters of turquoise blue flowers. 9″. Summer. (4).

Chionodoxa. Glory-of-the-snow. *C. luciliae*, with several bright blue, white-eyed stars per 6″ stem, and the larger, paler blue, *C. gigantea* increase rapidly and are best naturalized under deciduous trees. In the rock garden try either of the following: *C. sardensis*. Very dark blue 3/4″ flowers with tiny white eye. 6″. Early spring. (4); *C. tmoli*. Brilliant blue, white center, later in flower. 4″.

Crocus—Spring flowering. Most often seen are the large-flowered Dutch hybrids in orange, mauve, purple, and mauve/purple striped. The following species is daintier, with a bigger selection of color forms. *C. chrysanthus*. 'E. A. Bowles' is bright yellow (not to be confused with the darker yellow 'E. P. Bowles'); 'Snow Bunting' is creamy white; 'Blue Pearl' is silvery blue. There are many more. All are feathered outside with purple or brown.

Crocus—Autumn and winter flowering. These give of their best only in areas where autumn merges gently into a moderately mild winter. *C. niveus*. White chalices with scarlet style and yellow anthers. Leaves and flowers come together in October/November. *C. medius*. Deep lilac purple. October/November. Leaves follow the flowers. (6). *C. laevigatus* 'Fontenayi'. Rosy lilac flowers as early as the weather permits between late November and February. (6).

Cyclamen. These miniature replicas, only a few inches high, of the florists' cyclamen do best in a loose leafy soil, shaded for most of the day. Few plants are as tolerant of dry shade and compet-

Roche

Iris cristata, a reliable dwarf iris of easy cultivation.

ing tree roots. The tubers rot in wet soils. Plant shallowly, about 2″ apart, 3″ for *C. hederifolium* (*neapolitanum*). The bottom of the tuber is usually smooth and rounded. Warty protuberances (from which come flowers and leaves) mark the top. Roots may come from the bottom but more often from the sides or top.

There are cyclamen which flower in winter (*C. coum*), spring (*C. repandum*) and summer (*C. purpurascens*), but the hardiest and easiest to grow is the autumn-flowering *C. hederifolium* (*neapolitanum*), with pink flowers in autumn (also a white form). The ivy-shaped leaves, beautifully and varyingly patterned in silver, follow the flowers and last through winter and spring. (5).

Cyclamen tubers increase in size each year. (Old tubers of *C. hederifolium* may be as large as dinner plates.) They do not divide or produce offsets. Easily raised from seed, but take three or four years to flower.

Eranthis. The winter aconites need sun when in flower but are indifferent to sun or shade during dormancy. Ideal for growing under deciduous trees. Best grown from seed (sown *in situ*). Less than half the shrivelled tubers sold in autumn survive to flower in spring. 4-6″. (4). *E. hyemalis*. One reads that this species self-sows too freely for the rock garden, but rarely does a gardener complain of over-abundance. Shining yellow flowers, 1½″ across, sit on an Elizabethan ruff of divided green leaves, often emerging through the snow. *E. cilicica*. Deeper yellow, foliage bronzy, leaves more finely cut. Less rapid increase. *E.* x *tubergenii* is a desirable but hard-to-come-by hybrid between the above two species.

Galanthus. Snowdrops. All species and varieties are desirable. They differ mainly in their flowering time. The only one easily obtainable is *G. nivalis*, a woodlander but content with a summer-shaded pocket in the rock garden. 6″. (3). *G. elwesii*, sometimes offered, is bigger in all its parts and blooms earlier.

Iris. *I. danfordiae*, chubby and yellow, is the most frequently offered bulbous iris. Rarely does it subsist for more than two years. The following are more reliable, though substantial colonies are rarely seen. *I. reticulata*. Flowers on 6-8″ stems before the leaves appear. The

B. A. Mech

An easily-obtained snowdrop, *Galanthus nivalis*, grows well in shade or in rock-shaded summer sun.

An extremely attractive dwarf daffodil, *Narcissus triandrus albus,* is also easy to grow.

Roche

leaves elongate to 15″. Pale blue 'Cantab' and violet blue 'Harmony' (or the similar 'Joyce') are two of the prettiest. Very early spring. (5). *I. histrioides major.* So low-growing that the dark blue flowers seem to sit on the ground. An invaluable winter or early spring bloomer, more persistent on heavy soils than on sandy ones. 4″. (5).

Leucojum. Snowflake. The spring snowflakes, *L. vernum* (9″) and *L. aestivum* (15″) grow best in a moist, partially shaded site. Much smaller in scale, and needing well drained soil and sun are the two following: *L. autumnale.* String-slender upright leaves and, in late summer or autumn, stems tipped with wee white pendulous bells. 6-8″. (5); *L. roseum* is similar but pale pink.

Narcissus. Daffodil. Of the many small daffodils, the hybrids are usually easier to grow than the species. The following are a few I have enjoyed and found reliable. *N. triandrus albus* is one of the best-loved miniatures but seldom long lived. *N. asturiensis (minimus).* Bright yellow. The smallest trumpet daffodil. The flower stalks lean, so surround it with grit to prevent mud splash. If no flowers appear check that slugs are not eating the buds at ground level. 4″. Late winter/early spring. (4). *N. rupicola.* Upfacing, shallow-cupped 1″ yellow flowers, rushlike leaves. For a dry spot. Self seeds. 6″. *N. scaberulus.* One to 3 tiny golden flowers per 8″ stem. *N.* 'Bobbysoxer'. Butter-yellow perianth, darker cup. Early. 6″. *N.* 'Sundial'. Citron yellow perianth, darker cup. Early. 6″. *N.* 'W. P. Milner'. Old, reliable, good. A dainty trumpet daffodil with nodding creamy flowers. 8″. *N.* 'Xit'. Pure white, overlapping perianth segments, small cup. 6″.

Rhodohypoxis baurei. 2-4″. Late spring and summer. (8). A South African plant for a sunny place in porous soil, not overly dry. Outstanding where hardy. Tufts of grayish, hairy, swordshaped leaves (never untidy) and a succession of flat 1″ flowers with six overlapping, unevenly oval petals. The species is bright pink. Among the prettiest hybrids are 'Perle' (pure white), 'Pictus' (white with pink tips), 'Dawn' (pale pink) and 'Susan Garnett Botfield' (apple-blossom pink and white). The tiny cormlike roots are easily lost if disturbed. To prevent this I use *Sedum hispanicum minus* as a carpet through which they grow.

Scilla tubergeniana. Invaluable for early flower. Several crowded spikes of small bells, pale blue with a darker stripe. *Puschkinia scilloides (libanotica)* is a look-alike bulb and they share the habit of opening their flowers as they emerge from the earth (a ready prey for slugs) when grown in sun. The stem elongates more in partial shade.

Some Bulb Suppliers

The Daffodil Mart, Gloucester, VA 23061—catalog $1; Broadleigh Gardens, Barr House, Bishops Hull, Taunton, Somerset, England; Avon Bulbs, Bathford, Bath BA1 8ED, England (rare bulbs); Russell Graham, (successor to E. L. Kline), 4030 Eagle Crest Road N.W., Salem, OR 97304 (specialists in cyclamen, many other bulbs); International Growers Exchange, Farmington, MI 48024. Catalog $3.

Note: No import permit is needed when ordering bulbs from England. ❦

Highlights among . . .

LOW SHRUBS

Marnie Flook and Frederick McGourty

There are many low-growing shrubs for the rock garden. Let us look first at a few dwarf conifers, which have an appropriate appearance and can form the backbone of a garden, especially in winter. New gardeners should be advised that in horticultural parlance "dwarf" is a relative term. There are few true pygmies. Visits to mature collections in the major botanic gardens will help refine the choice of these needled evergreens.

Chamaecyparis lawsoniana 'Forsteckensis' is a low compact mound with tiny scalelike leaves on twisted branches. Lawson-cypress, though native to only a small area of the Oregon coast, is one of the most variable conifers, and many cultivars have been named. Few perform well over the longer term in the Northeast.

Chamaecyparis obtusa 'Nana' is the true dwarf Hinoki-cypress from Japan, with dark green, cupped foliage in layers. It is a very slow-growing little shrub. 'Nana Gracilis', faster growing and ultimately larger, is sometimes confused with it. Relatively shade tolerant.

Juniperus communis 'Compressa' is a miniature field juniper resembling a sentinel. Seldom over 3'. In small groups it suggests a forest. Underplanted with pussy-toes (*Antennaria*) or snow-in-summer (*Cerastium*), it evokes the image of an old field in rural New Jersey.

Juniperus horizontalis 'Bar Harbor', *J. h.* 'Wiltonii' and other cultivars. These are prostrate junipers with blue-green foliage and long trailing branches. They are fast growing but easy to prune. Have attractive way of following contours of rock and ground. To get ideas for garden use, see the species grow on the rockbound coast of Maine.

Juniperus chinensis procumbens 'Nana' is a more spreading mound with very prickly leaves of bright green. Especially nice cascading over a wall or boulder. Also will need to be pruned.

Picea abies 'Clanbrassiliana', *P. a.* 'Maxwellii', etc. The dwarf Norway spruces, of which there are a lot, form dense low mounds with dark green needles. They are more shade tolerant than many conifers.

Picea glauca 'Conica'. After many years the dwarf Alberta spruce will attain 10'. It forms a tight cone with soft green needles and can be mistaken for no other conifer. Customarily used as a single specimen, but a group can be striking if the garden is large. Evocative of the high mountains.

Pinus aristata. In the White Mountains of California spreading old bristlecone pines, which are among the most ancient trees on earth, are magnificently gnarled. Usually a small erect tree in cultivation. The stout branches, resembling green bottlebrushes, are covered with short needles that are dotted with a white resin. A slightly untamed beauty, performing best in areas with cool summers.

Pinus mugo, the Swiss mountain pine, is highly variable, and most specimens become large broad shrubs in time. They look so innocent when young, but then so does a catalpa. More-or-less dwarfs such as var. *pumilio* are available, but the gardener should closely check the growth rate of the particular plant in the nursery before purchase. Nipping one-half of the growth from each new "candle" in spring helps control growth.

Tsuga canadensis 'Bennett' is a flat-topped, slightly weeping hemlock which grows to 3-4' and at least as broad. The appearance is much like a Sargent weeping hemlock, and the uses are the same, in miniature. *T. c.* 'Cole' ('Cole's Prostrate') is completely prostrate, forming a broad mat. It is very distinctive, for with age there are no needles on branches in the center. Irreverently called "Old

Roche

Native junipers and huckleberries form a semidwarf mat among the rocks.

Baldy''. Young plants may be staked and trained up, then allowed to cascade for a novel effect. Hemlocks are shade tolerant, but 'Cole' actually requires it for best performance.

Rhododendron Kin

Plants in the Heath Family (Ericaceae), which is to say, rhododendrons and their relatives, are apt to grow best in well aerated, acid, sandy soils containing abundant organic matter such as peat moss or leaf mold. Most need (or benefit from) some shade, protection from strong sun and wind in winter, and a year-round mulch. A number are evergreen, making an attractive addition to the garden at all seasons. They thrive best in the eastern, northern and northwestern parts of the United States, the natural acid-soil areas.

Gaultheria procumbens. Wintergreen, a favored native plant of the East, forms a carpet of dark green leaves which turn bronze in winter. It has waxy white, bell-like flowers in spring and persistent, bright red fruits in autumn.

Gaylussacia brachycera. Box huckleberry, another eastern native, spreads by underground runners. Its shining dark green leaves turn bronzy red in fall. Small urn-shaped flowers in spring are succeeded by fruits which turn blue. This is a botanical Methuselah, one plant colony in central Pennsylvania estimated to be 13,000 years old. (For an account see J. W. Adams' article in BBG Handbook #22, *Broad-leaved Evergreens*.)

Leiophyllum buxifolium. Sand-myrtle, from the New Jersey Pine Barrens and Grandfather Mountain in North Carolina, grows best in sun. It has tiny lustrous leaves. In spring pink flower buds open to starry white blossoms. Not the easiest to tame.

Pieris japonica, misleadingly called "andromeda" (there is a separate genus of bog plants with that name), has several cultivars suitable for the rock garden. 'Bisbee's Dwarf' has small leaves and makes a blocky mound. 'Pygmaea' has slender, almost needlelike leaves ½"-1" long and gives a lacy appearance. Neither is grown for its flowers.

Rhododendron. There are many fine dwarfs. *R. fastigiatum* and *R. impeditum*, to 1', have narrow gray-green foliage and purple-blue flowers. *R. keiski*, available in a dwarf form, has clear yellow flowers, good winter color. One of the nicest is *R. racemosum*, with red stems, clusters of

Roche

A choice trailing dwarf juniper, *Juniperus chinensis procumbens* 'Nana', will in time cascade over a wall.

pink flowers and dark green leaves which are silvery on the back. *R. yakusimanum* has remarkably woolly leaf undersides. Pink buds open to white flowers. There are many forms. Slow growing, choice. When a gardener proudly says he has a *yak* on his miniature mountain, he does not mean an animal! *R.* 'Gumpo' (white flowers) and 'Pink Gumpo' are very low and spreading. They flower several weeks after the main rhododendron display in spring. Unfortunately, rabbits esteem them as highly as do gardeners.

Vaccinium vitis-idaea. Mountain cranberry is a low creeping shrub with shining leaves and red berries, which come after attractive little pink-to-red flowers. Height: 8-10″. *V. v.* var. *minus*, only a few inches high, is a special delight. Also low, with congested tiny foliage is *V. macrocarpon* 'Hamilton', an ornamental selection of the cranberry of commerce. It does not need bog conditions but appreciates a little extra watering during dry spells.

Heaths and Heathers

These are also ericaceous shrubs with most of the same requirements mentioned above, except that they prefer a very light sandy soil, sharp pruning back in spring and in most regions a pine needle covering in winter. They are best in coastal areas, frequently short-lived inland. Apart from use as little specimens, heaths and heathers may be employed in the rock garden for ground covers and to face down larger shrubs, as well as to contrast with *Bergenia* and other bold-leaved plants.

One of the best is spike-heath (*Bruckenthalia spiculifolia*), which has needlelike foliage and, in late spring, small spikes of pink flowers. True heather

(*Calluna vulgaris*) has small overlapping leaves with scalelike appearance. Cultivars, of which there are many, bear little urn-shaped flowers in summer or fall. 'Foxii Nana', a 4″ high bun has purple flowers August-October. 'J. H. Hamilton', to 9″, has pink double flowers at the same time. 'Crispa' is taller with bright green leaves and white flowers. 'Mrs. Ronald Gray', to 4-5″, has reddish flowers.

The ericas or heaths have leaves resembling tiny pine needles. Among the hardiest are *Erica carnea* cultivars such as 'Winter Beauty' (red flowers, late winter, spring), 'Springwood White' and 'Springwood Pink', which also bloom in late winter and early spring.

Other Evergreen Shrubs

Like dwarf conifers, dwarf broadleaved evergreens often get too large for the rock garden. Here are some low growers which will probably never grow out of scale. Kingsville dwarf box (*Buxus microphylla* 'Compacta') makes a dense, light green mound. Plants of such form may serve as visual substitutes for rock. The branches of *Daphne arbuscula* have thin needlelike leaves and pinky-lilac flowers in May. *D. cneorum* is more fragrant but tempermental, with deep pink flowers in clusters in spring. Its evergreen leaves are narrow, about an inch long, on slightly trailing stems.

In time most Japanese hollies grow too large for the average rock garden, though *Ilex crenata* 'Helleri' fits well into larger ones if a 3-4′ tidy dark green dome is wanted. Of more interest perhaps is the lower growing 'Dwarf Pagoda', which has picturesque asymmetrical form and diminutive coin-shaped foliage.

Paxistima canbyi, a little euonymus relative from the Appalachians with no common name except rat stripper (which probably won't become very common), forms a dense evergreen clump. However, its yellow roots travel, sending up shoots far from the parent. It is an occasional ground cover. A taller plant, *Sarcococca hookerana* var. *humilis*, likes shade. It has inconspicuous but fragrant white flowers in early spring and long leathery leaves. It is stoloniferous and may need its lower wings clipped from time to time. Not winter hardy in the colder reaches.

B. A. Mech

Dianthus erinaceus, an example of classic rock garden buns, mulched with crushed stone. Non-woody.

Deciduous

Among shrubs that lose their leaves in winter there are some good choices. Bush cinquefoil (*Potentilla fruticosa*) with gray-green foliage, is very variable in size and flower color, so the purchase of cultivars is desirable if one can't see a plant before purchase. Even then, some are inconsistent. As a rule, the flowers are yellow and have a long bloom period in cold regions. They resemble little roses.

A dwarf forsythia, *F. viridissima* 'Bronxensis', may appeal to some gardeners, also dwarf willows (*e.g.*, *Salix uva-ursi*) and dwarf birch (*Betula nana*). One may also wish to explore the many kinds of *Cotoneaster*, but most grow out of bounds in time.

Spiraea japonica 'Alpina' is one of the smallest spireas. It makes a dense foliage mound and has refined small leaves. Flat clusters of small pink flowers appear in early summer. *S. bumalda* 'Crispa', with darker foliage and flowers, has a slightly more lax growth habit. For other possibilities see BBG Handbook #84, *Small Gardens for Small Spaces*, and *Dwarf Shrubs for the Midwest* by R. M. Keith and F. A. Giles (University of Illinois at Urbana-Champaign, College of Agriculture, Special Publication 60).

With a twist . . .

ON THE DRY SIDE—THE ARID ROCK GARDEN

Roy Davidson, Margaret Williams Charles Thurman and Norman Deno

Arid gardening is dry gardening. Yet it is far more, too, a dichotomous pursuit, one of diverse interpretation according to the whim and circumstance of the gardener. One view is for those who must cope with the naturally arid situation, most often with its excesses, and the other is for those who, in spite of humid surroundings, would strive to grow and enjoy arid-loving plants. When we add to this all the degrees of aridity (as well as only the seasonal condition, both in soil and atmosphere) and also all the degrees of tolerance and adaptability of plant life, the aspects of arid gardening begin to take on all the fascination of the gaming table.

Bright, even glaring, light goes hand in hand with dryness. Most gardeners would temper the harshness for their own comfort as well as to induce a greater variety of plants to prosper, planning controls of the drying effects of both sun and wind, and of course adding water, unless it is a desert that is wanted.

The creation of aridity is perhaps the more taxing of the gardener's ingenuity; there is more to it than withholding moisture. Site-planning, contouring and special attention to air circulation, soil porosity and plant orientation are still as critical, but they must be devised with the reverse goals in mind.

The classic patio garden we associate particularly with Spain probably has best accomplished the ultimate in comfort for both people and plants in a searing climate. The simple expedient of almost—but not entirely—enclosing space and then providing canals or jets or dripping fountains of water is one of great aesthetic appeal as well, and although the original concept was an architectural one, the identical principles may be adapted to a setting for a natural or rock garden, one with water features.

The Naturally Dry Area

Just because one lives in an arid climate, it does not necessarily follow that growing dry-climate plants, except perhaps cacti, will be an easy matter. But given a sufficient amount of supplemental water, plants from moderately moist habitats are far easier to cultivate. With some compromises a variety of good things from many habitats may be accommodated in harmony.

Within a single valley in any arid country there are numerous microhabitats depending on precipitation, soil factors, prevailing winds, elevation and exposure. In the garden the exposure and elevation cannot be controlled, but other factors can be modified to a degree. Buildings, fences, walls, trees and shrubs, even rocks themselves, can temper the situation and ameliorate the drying effects of sun and ever-present winds.

Soils in arid areas seem most often to consist of a thin sandy loam overlying impermeable clay or hardpan. To put plants into this soil and then water them can be disastrous, yet without water they will die. One solution is to construct deep beds of well drained, man-made soil. Here is an all-purpose mix for them: 2 parts sandy loam, 2 parts well rotted sawdust, 1 part pea-size pumice gravel. Such beds must of course be watered, sometimes even in winter. In summer it may be necessary to soak them as often as three times a week, depending on the rate of drying. Water deeply to induce deep rooting. Rocks make ideal retaining walls for these planting beds, and other rocks can be placed to alter the exposure of a specific small area. Still others, large or small, can make an excellent mulch, slowing surface evaporation while providing condensation surfaces for moisture as it rises by capillary action.

Life-lengthening Procedures

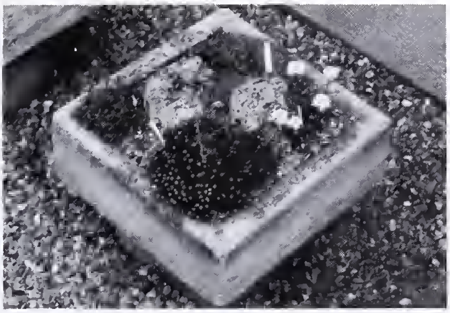
In growing dry-climate plants, the basic way to combat excess moisture and its accompanying humidity is to provide a rapid-draining soil. This is true even though many of these plants are suited to a heavy and poorly drained soil of high nutrient quality in areas where they occur *naturally*. However, in the garden, where conditions are very different, this poses the question of longevity. Frequent mild feeding might induce an extended life span for some of these plants.

Many dry-climate plants are protected from the sun by densely hairy leaves which give a gray or silvery appearance. The leaves are often very attractive but are easily damaged or even destroyed by excessive moisture. In a few instances it may be desirable to devise shelter for deflecting rainfall at least from leaves and stems, but the roots must receive their share of moisture. A jutting rock or overhanging ledge offer possibilities for such deflection.

Other Ways to Provide Dryness

Although most rock gardeners may be concerned with combating summer drought, there is a rich and varied group of plants for which summers may always be too wet, especially in the East. Among these may be counted the beautiful flowers from Wyoming deserts and other parts of the West, those from Spain and from eastern Turkey and Iran. If these are to be successfully grown, the extreme treatment is to grow them in cold frames. In summer the glass is propped open in such a way as to allow free ventilation while shielding them from rainfall. This is a common procedure in European horticulture and, recently, bulb frames and alpine frames have become popular here, differing only in what is grown in them. (See page 68.)

It is quite possible to achieve needed dryness in other ways more pleasing to the eye. These may not be completely effective but still give the aesthetic pleasure of presenting the plants in more natural surroundings. Some situations that have proven themselves include: 1) a south slope of about 30°, allowing the sun to strike with fullest force in summer and thus allowing faster drying; 2) a layer of 5-10 inches of sand over ordinary soil, achieving maximum porosity and ventilation to the roots; 3) planting to the south side of a pine (or similar tree) whose branches will shed summer showers and whose roots will draw up the excess of soil moisture and cool the atmosphere by transpiration; 4) a sloped clay bank (south exposure preferably) which will effectively shed most of the summer showers. Juno irises seem particularly suited here, also other subjects requiring a heavy soil.



M. Joyner

Trough gardens are one method of controlling moisture in the arid rock garden.

To this could be added the structures or contrivances for controlling light intensity. Not all rock plants are able to survive everything the sun can lay on, and lath or shade-cloth structures, temporary or permanent, can create the same effect as a shade tree, instantly and without root interference.

In many gardens there may not be sufficient space for each plant to have its own way entirely, and this may lead to container gardening, that is, cultivation in pots or in small trough gardens, each of which might be a small miniature landscape. These may be placed about the garden itself in feature positions, although many people prefer that they be related to terraces or other architectural adjuncts. One advantage of container plantings is that they may be moved about. Special attention can be paid to soil, water and light according to the individual needs. Not the least advantage to growing in containers is the fact that dry-climate subjects may escape wet periods by being placed in sheltered areas, such as under the eaves of buildings.

As a complement grow some carefully selected . . .

ANNUALS

Marnie Flook

Most plants in the rock garden will be diminutive perennials, bulbs and dwarf shrubs, but a few small annuals deserve a place, too. They are especially useful to cover bare places when bulb foliage disappears in early summer. Many annuals have a long bloom period, providing color in summer and fall after most rock plants have ceased flowering. Annuals are also employed to cover space in a rock garden during its first year, to fill the sparseness of new plantings. Some growers like to keep a few available in case a rock garden perennial dies and leaves a gap.

The annuals chosen should be low growing, neat and compact, with the "look" of a rock garden species, not a bedding plant. Red salvia or bright flaming pink zinnias just won't do. Avoid plants which are mops, or which are always saying, "Look at me!"

A refined appearance counts, at least in the rock garden. Seeds of suitable kinds are available from seed companies and, for the less common ones, the ARGS Seed Exchange. A few possibilities are listed below. They are sun-worshippers unless otherwise noted.

Androsace lactiflora, to 1′, has thin stems with umbels of small white flowers. It usually self-sows from year to year.

Two centauries, *Centaurium chloodes* and *C. pulchellum,* have pink blossoms on 3″ stems. These relatives of the gentian benefit from a more moist location than the above androsace. They will probably self-sow in your garden.

Dahlberg daisy (*Dyssodia tenuiloba*) has yellow flowers 8″ above lacy foliage. Sow seeds indoors in late winter and

Creeping-zinnia (*Sanvitalia procumbens*) is a good annual for trailing over rocks or down a wall.

Photos by G. Taloumis

Sweet-alyssum (*Lobularia maritima*) makes a good edging as well as filler plant for otherwise bare earth.

move young plants to the garden after danger of frost. In catalogs Dahlberg daisy may be found under its former botanical name, *Thymophylla*.

Erinus alpinus grows well in partly shaded walls and rock crevices, seedlings usually appearing each year. The flowers, which may be pink, purple or white, are borne on stems 4-6″ above tufts of light green leaves. A snapdragon relative.

Diamond flower (*Ionopsidium acaule*), a tiny cress, has dainty four-pointed violet flowers 4″ tall. Partial shade is best.

Sweet-alyssum (*Lobularia maritima*) is best known in its white-flowered varieties. There are also pink and purple ones. They all grow several inches high and a foot or more across. May be sown directly in the garden, blooming in 5 to 6 weeks from seed. Valuable for long flowering, but too vigorous to place near perennial treasures.

Virginia-stock (*Malcolmia maritima*) resembles an aubrieta more closely than stock. Small flowers on 5-inch-high plants are lilac, deep pink or white. Quick flowering from seed, which may be sown directly in the garden. Tolerant of autumn frosts, as is sweet-alyssum.

Cupflower (*Nierembergia hippomanica* var. *violacea*) forms a clump of narrow leaves with blue or white flowers during summer. Start seed early indoors. Former name: *N. caerulea*.

Creeping-zinnia (*Sanvitalia procumbens*) is a trailing plant having leathery green leaves and small yellow daisies with prominent dark centers. Best started indoors. A charmer.

Saxifraga cymbalaria, with fleshy leaves and yellow flowers, and *S. sibthorpii*, a more upright plant also with yellow blossoms, are unusual choices for a shady area.

Verbena peruviana is a tender perennial from South America. Its clusters of scarlet flowers are in bloom most of the summer. The stems sprawl, so don't place this plant next to choice small rock garden subjects. Take cuttings in autumn and carry them over winter in a cold frame. ✤

FURTHER READINGS

Marnie Flook

There is a wealth of rock gardening literature, but unfortunately most of the books published before 1970 are out of print. For the difficult-to-locate older volumes, remember the library-loan service the American Rock Garden Society has for its members. (See page 75.)

All About Rock Gardens and Plants by Walter A. Kolaga. Doubleday and Co., New York, 1966.

Alpine and Rock Gardening by W. E. Shewell-Cooper and others. (Vol. II in the Ullswater Library of Gardening.) Seeley Service and Co., Ltd., London, 1961.

Alpine Gardening by Roy Elliott. (Vista Books, London, 1963.) Reprinted by Theophrastus Press, Little Compton, RI.

Alpines by Lionel Bacon. David & Charles, Newton Abbot, Devon, England, 1973.

The English Rock Garden, 2 vols., by Reginald Farrer. (Nelson, London and New York, 1918.) Reprinted by Theophrastus Press, Little Compton, RI., which has also reprinted several other Farrer books, including *My Rock Garden.*

Guide to Rock Garden Plants by Anna N. Griffith. E. P. Dutton & Co., New York, 1965. (In London, titled *Collins' Guide to Alpines.)*

How to Plan, Establish and Maintain Rock Gardens by George Schenk. Lane Book Co. (Sunset Books), Menlo Park, CA, 1964.

Manual of Alpine Plants by Will Ingwerson. Will Ingwerson and Dunnsprint, Ltd., Eastbourne, England, 1978.

Manual of Dwarf Conifers by H. J. Welch. (Revised edition of an earlier work.) Theophrastus Press, Little Compton, RI, 1979.

Miniature Shrubs by Royton Heath. Barrie and Jenkins, Ltd., London, 1978.

The Present-Day Rock Garden by Sampson Clay. (Nelson, London and New York, 1937.) Reprinted by Theophrastus Press, Little Compton, RI.

Rock and Water Gardens. Time-Life Books, Alexandria, VA, 1979.

Rock Garden and Alpine Plants by Henry Correvon. Macmillan Co., New York, 1930.

Rock Garden Flowers by Cestmir Bohm, translated by Olga Kuthanova. Hamlyn Publishing Group, London and New York, 1973.

Rock Garden Plants by Doretta Klaber. Henry Holt & Co., New York, 1959.

Rock Gardening by H. Lincoln Foster. Houghton Mifflin Co., Boston, 1968. The standard American reference, though out of print.

Rock Gardens by Jerry S. Stites and Robert G. Mower. Information Bulletin 159, Extension Publication of NY State College of Agriculture and Life Sciences, Cornell University, Ithaca, NY.

The Seedlist Handbook, 2nd edition, by Bernard E. Harkness. Kashong Publications, Geneva, NY, 1976.

The World of Mountain Flowers by Uberto Tosco. (World of Nature Series.) Bounty Books (Crown Publishers, Inc.), New York, 1973.

Also, the following Brooklyn Botanic Garden Handbooks:
Dwarf Conifers
Gardening with Wild Flowers
Miniature Gardens
Perennials and Their Uses
Rhododendrons and Their Relatives

Eighteen ideas . . .

FOR A MAXIMUM OF BEAUTY

G.K. Fenderson

One. The garden should remain as open and uncluttered as possible, with a minimum number of visual distractions. It is neither necessary nor desirable that all of it should be visible at once; rather, those areas which are visible should present a unified, well thought-out picture with balance, interest, perspective and, above all, restraint. A natural visual progression from one area of the garden to another should be apparent. Not every plant in the collection should be on display at once. An ideal garden would consist of a gradually unfolding series of plant tableaus, each constructed with the intent of providing an ideal cultural and aesthetic setting for its components.

Two. Be bold with the initial layout of the garden. Make sure that paths are adequate for wheelbarrows, mowers, garden tractors and pedestrians. Generosity in the size of the planting area to be developed will help eliminate crowding and will provide ease of access for maintenance.

Three. Be bold with the use of rocks; use but few, use them strategically, and make sure they are large and significant enough to be in scale with the remainder of the planting. Make sure they appear settled and are of a color and texture not alien to the raw materials of the garden. If they meet none of these criteria, do not use them.

Four. Leave some uninterrupted vista, be it water, lawn, rough meadow, uncluttered woodland glade, or distant prospect, on which one can rest the eye.

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Careful use of native stones and gravel, conscientious maintenance and the choice of a plant *(Arenaria montana)* in good scale with the site make for a more attractive rock garden.

Visual breathing space is important.

Five. Be extremely critical, when planting gardens under or near trees, of which trees (and of which kinds) you retain. Removing natural visual clutter often can produce better design than any number of additions you might make. Trees to be eliminated should be selected well in advance of developing the rock garden. Strive to have your site appear as attractive as possible before any plantings are made. Remember, the site will become the permanent showcase for your collections.

Six. Don't overplant. Allow space for plants to grow and develop uncrowded to their best advantage. Don't short-change yourself of future pleasure by opting for instant garden effect; such efforts are costly, extremely short-lived, and can mean much extra work and the loss of valuable plants within a short time.

Seven. Be bold with the use of accent plants, *e.g.*, those with distinctive form, color or texture. But use them in moderation; otherwise, that which makes them distinctive is lost in a clamor of many contrasts.

Eight. Choose for the backbone of focal points of your design only plants of known durability, hardiness, general good health and long season of interest. Leave for the background or less conspicuous areas plants of marginal hardiness, those that are prone to pests, those that have a shabby dormancy, and those of mere botanical interest, however rare.

Nine. Enliven the monotonous effect of collections of closely allied plants by including plants dramatically different in form and texture.

Ten. Give full consideration to heights, lengths, and general proportions of planting areas. For example, a stiffly rectangular raised bed, though perhaps easier to build, would be visually jarring in a garden where the majority of the lines were soft curves. So too would a very free-form simulated rock-outcropping in very formal surroundings.

Eleven. Keep the use of man-made and non-indigenous materials (such as cement, brick, slate, railroad ties, newly-quarried or foreign stone, glass and plastic) to a minimum Do not mix mediums unnecessarily. For example, if there is a need for a raised bed, try to incorporate it into an existing wall or strucutre. Build it with native stone whenever possible, rather than contrast the fieldstone of one bed with the bricks of another and the wooden ties of yet another.

Twelve. Be conscious of surface texture and try to avoid too many varieties and discordant combinations. For example, a rock garden mulched with very light or highly colored stone in a woodland setting appears unnatural, however beneficial the topdressing may be to the plants being grown there. Likewise, a mulch of pine needles looks strikingly out of place in an open sunny area far removed from any pine trees. Use native mulches whenever they would be less distracting to the eye. They are usually cheaper, and more readily available.

Thirteen. Provide a generous cold frame and nursery area. Such an area, used for propagation and evaluation of plants before they earn a place in the landscape, will contribute greatly to the overall appearance and order of a garden.

Fourteen. Try to have a yearly housecleaning. Give excess plants away or discard them. Remain constantly conscious as to whether a specific plant is justified in terms of the space and time required for its care. Be critical of inferior clones; grow only the best. Try to avoid redundant collections. Don't allow your garden to resemble either a warehouse of plants or a hospital ward of perpetual invalids.

Fifteen. Try to rebuild and correct defects in old gardens before developing new areas.

Sixteen. Label only the most recent acquisitions and those of which you are uncertain. Labels are often an intrusion in the landscape, and their lack improves the memory. If you must collect, collect plants, not labels. Don't allow your garden to resemble a cemetery for mice.

Seventeen. Invite garden groups frequently, including the local unit of the American Rock Garden Society. This will improve your housekeeping.

Eighteen. Know when to leave well enough alone. Have the self-discipline not to intrude too much into the natural landscape.

W. M. Flook

For March, *Adonis amurensis*

BLOOM THROUGH THE SEASONS

Want something in flower every month? Don't want to excavate to China or build an alpine house for the hard-to-grow? Here are some old reliables, easy to grow and sure to give pleasure. Bloom times are approximate, based on the New York City year, which is sometimes erratic, but so it is everywhere.

January. If mild, a few heaths, including deep pink *Erica carnea* 'King George'. Giant snowdrops (*Galanthus elwesii*) planted near a south-facing door.

February. Winter aconite (yellow), snowdrops, early crocus (various colors), perhaps Christmas-rose (*Helleborus niger*) (white). Chinese witch hazel (*Hamamelis mollis*) if a shrub is wanted.

March. Small bulbs and, with luck, *Adonis amurensis* (yellow). Ericas revive. Cornelian-cherry dogwood (*Cornus mas*) (yellow).

April. More small bulbs (*Scilla, Chionodoxa*, etc.), miniature daffodils, *Anemone blanda* (various); then with *Arabis* (white or pink) an explosion of bloom. *Dicentra eximia* (pink or white) begins.

May. Arabis, aubrieta, basket-of-gold, perennial candytuft, moss pink (*Phlox subulata*), primulas in various colors, crested iris (blue or white), many others. *Geum borisii* (orange). Two long bloomers start—*Chrysogonum virginianum* (yellow) and *Coreopsis auriculata* 'Nana' (orange-yellow).

June. Dianthus in white or pink, campanulas in blue or white. *Inula ensifolia* (yellow), *Veronica spicata* 'Nana' (blue). Decapitate catmint (*Nepeta* x *faassenii*) (blue) after bloom for an encore.

July. *Astilbe chinensis pumila* (black raspberry) and *A. simplicifolia* hybrids (pink or white). Dwarf forms of *Platycodon grandiflorus* (blue). Long bloomers include various thymes (mostly rose), *Filipendula palmata* 'Nana' (pink), tunic flower (*Petrorhagia saxifraga*) (pink) and *Jasione perennis* (blue). Heather (*Calluna*) (pink to white) starts to flower.

August. *Allium senescens glaucum* (mauvish pink), *Chrysopsis* (yellow), *Liriope muscari* (lavender to white), leadwort (*Ceratostigma plumbaginoides*) (cobalt blue). Also, unless you are a purist, early cushion mum 'Baby's Tears' (white), more refined than most and long in bloom.

September. Some gentians (blue), dwarf asters and chrysanthemums (various), *Hosta tardiflora Sternbergia lutea* (yellow), *Sedum sieboldii* (rose).

October. Dwarf asters and chrysanthemums; *C. weyrichii* (white to pink) and *C.* 'White Bomb'. *Scilla scilloides* (deep pink), *Iberis* 'Snowflake', colchicum and crocus (various).

November. A few ericas begin again. Some cyclamen, colchicum and crocus. Berried shrubs and evergreens prove their worth now.

December. Some crocus, *Erica* 'King George', and Season's Greetings! Keep the faith, gardener. Spring will come someday.

Better not plant in the rock garden . . .

THE SEEMINGLY MEEK THAT INHERIT THE EARTH

Marnie Flook

Louise Beebe Wilder's book, *Adventures in My Garden and Rock Garden,* has a chapter on plants that, if allowed into the rock garden, would crowd out the good ones. Some of these are called weeds, others are considered "garden plants." She warns us to avoid any plant recommended for its creeping and trailing habit; to be suspicious of any plant called creeping Charlie or mother-of-thousands. Many are real charmers or at least you will think so until the time comes to keep them from strangling a favored lewisia.

Plants become invasive in a number of ways: their extensive top growth spreads over the surface and smothers neighboring plants; new roots form as layers beneath the top growth; they spread by underground suckers; or they produce thousands of seedlings.

There are places where such plants can be useful, where others won't grow or where they can be kept under control. *Ajuga reptans* spreads rapidly, making a good mat under trees. It does not belong in the small rock garden. *A. genevensis,* which stays in one place, is better suited, and its flowers are prettier, too. The variegated dead-nettles (*Lamium maculatum, Lamiastrum galeobdolon*) are coarse, trailing plants that perhaps have a place in a naturalized woodland where they can romp, not in the rock garden. If you insist on growing them and would like a different use, put them with annuals in containers, where their vining will not endanger other species.

Stringy stonecrop (*Sedum sarmentosum*) may be used where nothing else will grow, but keep it out of the rock garden. Almost as invasive is goldmoss sedum (*S. acre*). Both of these will take root wherever a piece of leaf falls.

Violets, which are so welcome in early spring, may become weeds. Plant Johnny jump-ups (*Viola tricolor*) in a little-used part of a crushed-stone driveway, not in the rock garden. Even two diminutive violets esteemed for their foliage, *Viola labradorica* and *V. variegata*, can become a bother, the first a substantial one, the second a lesser. Grow them in a flagstone terrace or in crevices between steps as a change of pace from thyme. In addition to being contained, they will be more attractively displayed.

Some ferns have spreading roots and do not belong in the garden—hay-scented, lady and sensitive ferns and bracken. Use them as ground covers in the woods, where they will crowd out underbrush.

Even some of the good old standby rock-garden plants such as arabis, basket-of-gold, iberis and cerastium may become too sizable for a small garden so should be situated with care. Planted in or on top of a wall, they will perform with less abandon.

Beware the octopi.

P. Frese

Self-seeded violas have overrun the rocky outcrop.

Author

The mound against the garage

The urban sanctuary needn't be privet and pachysandra. Put your imagination to work . . .

ROCK GARDENING IN A CITY BACKYARD

Eleanor Laden

Some thirty-three twin houses line the block on which we live in Philadelphia. The houses and London plane trees shading the street are over fifty years old. Each pair of houses is separated from its neighbors by a driveway which leads to a detached garage at the rear of the property line. In back, beside the garage, is a yard measuring 17 by 24 feet. Our house is close to an intersecting road that carries a large volume of traffic, causing some noise and pollution.

How It All Started

Some retreat from the city bustle was desirable, so we decided to transform our backyard into a garden. The first step was to enclose the yard. Masonry walls 6 feet high were built on the north and east sides. We used the garage as our south wall and the house as our west one, allowing for an entrance gate.

Earth within the yard, such as it was, was removed and carted away. Solid masonry block was used to outline the flower beds along the walls. The beds were designed to be 25 inches wide and 12 inches high above the completed garden floor. The center of the yard was filled with concrete and made level with the cement paving at the rear of the house. In doing so, provision was made for a slight taper toward the storm drain. Later, all cement surfaces were topped with handsome old brick in a simple running pattern. Thus did we make the outline for our first garden.

Sometime thereafter the flower beds were filled with a mixture of topsoil, manure, and peat for plants requiring acid soil. The garden was planted with two sourwood trees (*Oxydendrum arboreum*), one in each corner; at the base of one, we put a pair of 'Fedora' azaleas. A sweet-bay magnolia (*M. virginiana*) was planted in another corner and rewards us still with its attractive, persistent foliage and fragrant white flowers in late spring. In the last corner, a fragrant-spice viburnum (*V. carlesii*) was espaliered with splendid effect in an informal pattern against the garage wall. We also planted *Clematis montana rubens*, a pink flowered vine which has since grown tall enough to trail along and partially conceal unsightly utility wires. To these plants were added and subtracted over the years a fig tree, rose bush, camellia, leucothoe, various bulbs, perennials, annuals—whatever space permitted. The garden was really quite beautiful and rewarding, just as we had hoped. Indeed, after adding table and chairs we found freedom from noise and a measure of privacy we had not known before.

However, within several years the space became overgrown. The number of plants had to be reduced and the remainder pruned vigorously to keep the garden in scale. About this time I discovered dwarf plants at the exhibit of the American Rock Garden Society at the Philadelphia Flower Show. This convinced me to grow plants in scale with the size of my garden. I joined ARGS, read their publications and other rock garden books; took every opportunity to visit the gardens of ARGS members; attended slide lectures and seminars; took copious notes full of Latin names. It was fun, too, visiting natural areas, studying the woods, mountains, bogs, meadows and barrens whence the plants came. There were always ARGS members willing to give information about my newly discovered treasures. In contrast, plant sales proved frustrating because, at times, labels contained long, unfamiliar Latin names. Alas, the plants were barely visible! I persevered and bought as large a variety as possible, added these to the numerous kinds donated by my new ARGS friends, and returned to my studies. Soon I had a collection of special plants with special needs. But still no rock garden.

Remaking the Garden

In time, more of the large plants were dug up and given to neighbors. The sourwood trees, sweet-bay magnolia, espaliered viburnum and clematis remained, but little else. These supplied a tall background and frame for the rock garden subjects that followed. With most of the large growers removed the tiny backyard suddenly seemed enormous!

I began the rock garden by digging out, and saving for later use, several inches of soil from one of the beds and replacing it with an even larger volume of small stones, broken bricks and large gravel. On top of this I added enough coarse sand, watered in, to fill the spaces in this mixture. I thereby created the layer of good drainage material that is essential for most rock garden plants. A mix was prepared, by volume, of equal parts good commercial potting soil (with some garden soil added that I had saved), coarse sand and grit and stone chips of various sizes.

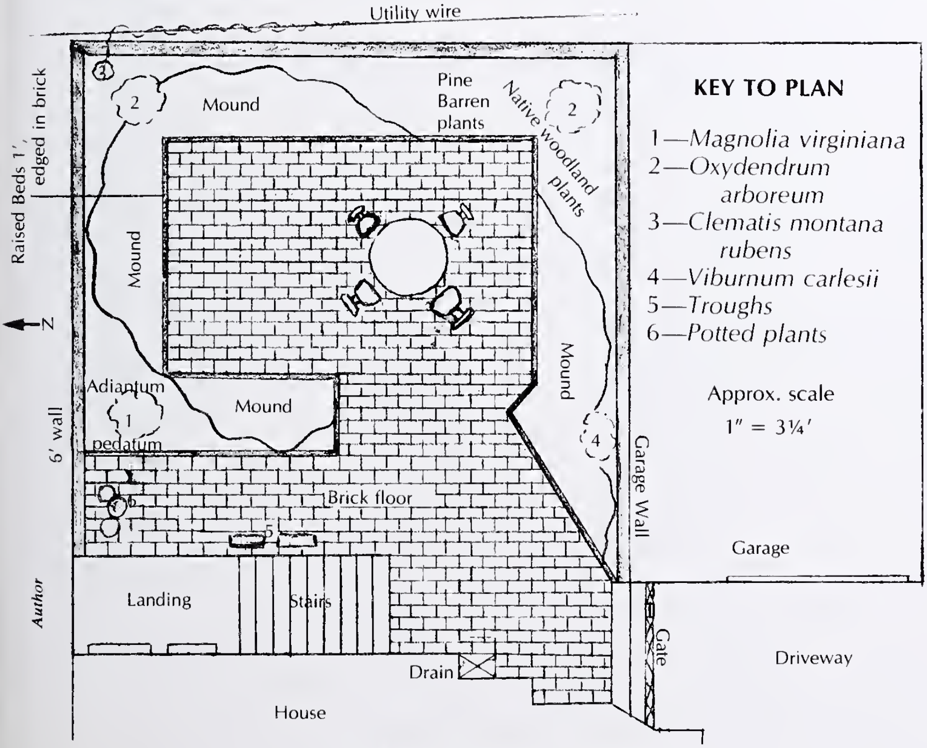
The mix was then spaded onto the rocky layer of drainage material in the bed. Working with small, manageable batches, I shaped the mound so it resembled a mountain or hillside. I tapered it in varying degrees to left and right for the entire length of the bed and tapered it, too, from a high point against the wall to the low point at the front of the bed. With some variation this theme was repeated in each bed.

All the while, different sizes of rock were arranged, commonly in groups of three, in an attempt to achieve a pleasing relationship. Each rock was tipped back and firmed in place on the mound. To test drainage each mound was watered and its shape modified to eliminate water accumulation. I found that well-placed rock improved the appearance of each mound, and alpine plants grew better if they sent their roots down near the rock's cool mass. The type of rock I chose was tufa—light in weight, water absorbent, easily broken with hammer and chisel and soft enough to drill holes for plants.

After considering such matters as foliage and flower color, growth habit and eventual size, I selected an appropriate combination of plants for each mound. Seasonal patterns of sun and shade had to be taken into account, too. I then placed the tallest plants toward the back of the bed, using dwarf conifers, dwarf shrubs and alpine rhododendrons. In front of these went lower-growing shrubs and perennials to provide contrast of size, color and texture. The foreground received the lowest-growing alpines, whose growth soon softened the hard line of the brick edging. Finally, miniature bulbs for early spring bloom were planted in areas which would be inconspicuous when the foliage turned yellow and died in early summer. As each mound was developed, it received an inch or more of red and gray stone chips as mulch. Such chips help prevent the crowns of plants from rotting and can unify and enhance the appearance of the garden. The dwarf conifers proved invaluable, creating an illusion of vast space and a distant mountainside. They retain interest year round.

Pine Barrens Area

One area was left without a mound so we could create an environment for plants of the New Jersey Pine Barrens. Part of this flat bed was dug up and replaced with a foot of sand acquired through a "plant rescue" operation in a Barrens area scheduled to be bulldozed. The low bed received water from the adjacent mound, a condition the plants from the Pine Barrens seem to thrive on despite their reputation for being "difficult." Growing successfully are sand-myrtle (*Leiophyllum buxifolium*), hudsonia (*H. ericoides*), pyxie (*Pyxidanthera barbulata*) and sheep-laurel (*Kalmia angustifolia*). Our Barrens adjoins a shady spot under the sourwood tree. Here thrive some native woodland plants including bloodroot



The Ladens' backyard rock garden

(*Sanguinaria canadensis*), merrybells (*Uvularia sessilifolia*), shortia (*S. galacifolia*), trailing-arbutus (*Epigaea repens*), partridge-berry (*Mitchella repens*) and, from Japan, slender iris (*I. gracilipes*). Different mosses make up the balance. Across the garden, under the sweet-bay magnolia, a beautiful stand of maidenhair fern (*Adiantum pedatum*) grows. Spring's bonus includes the seedlings of a tiny-leaved aromatic carpeter, the Corsican mint (*Mentha requienii*), wild columbine (*Aquilegia canadensis*), purple rockcress (*Arabis purpurea*) and other plants whose seeds have germinated in the crevices of the brick floor. *Mazus reptans*, having become invasive, has required the treatment reserved for weeds.

I should mention that rock plants in troughs and annuals in containers have been brought into the garden. Some rest on the brick floor, some on small metal stands, others on the table. This has created a beautiful effect and increased the space available for planting.

Care and Other Considerations

To look its best, a city garden must be kept exceptionally neat and clean. Watering of our kind of garden is best done slowly and deeply once each week. A light misting daily, if possible, will wash off city grime and soot. Plant labels are important but can spoil the appearance of a garden. I push them into the earth and leave only enough label showing to grasp with thumb and forefinger. To avoid heartbreak, keep the garden gate closed against dogs. Cats and squirrels, on the other hand, are unavoidable facts of life. The garden as described cost little to construct and is easy to maintain, in fact easier than many other kinds of city gardens.

City gardeners should not be discouraged by limited storage space and small working areas. A good commercial potting soil, packed in 50 pound bags, makes a suitable substitute for topsoil and can be stored easily. Most hardware stores and garden centers sell it. Coarse sand and various sizes of stone, gravel and grit are obtainable in bags from aquarium, garden and building supply centers.

If you contemplate using tufa rock, contact ARGS members and garden supply centers for information regarding sources of supply. If tufa is not available, consider using uniformly colored rocks from local streams or woods. Though each gardener has a preference, I recommend a mixture of ½″ red shale and gray granite chips. This makes an attractive and practical top dressing and mulch. It can be purchased at nominal cost by the bucket, carton, ton or truckload from local quarries.

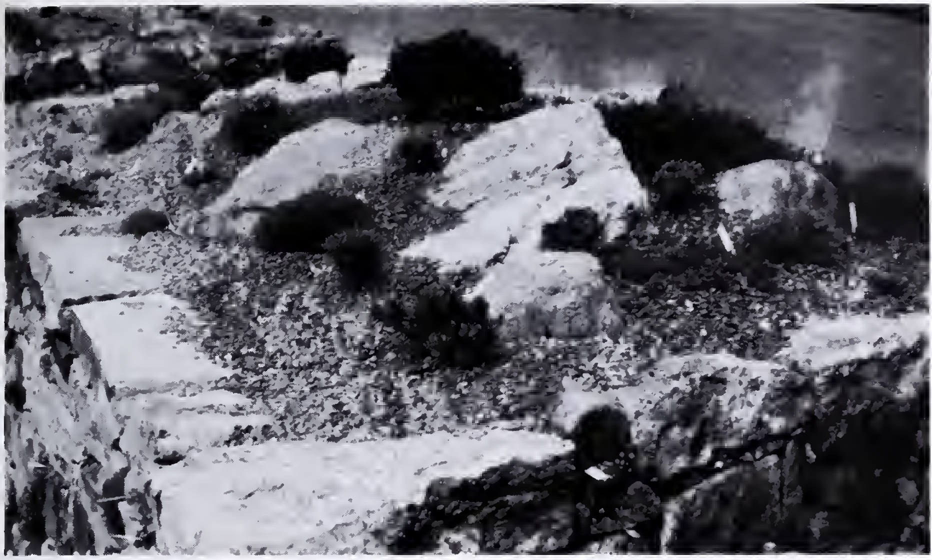
Plants for a City Rock Garden

Background—small evergreen trees and shrubs: Dwarf false-cypresses in variety (*Chamaecyparis obtusa* 'Nana', *C. pisifera* 'Plumosa Aurea Compacta', *C. thyoides* 'Ericoides'); *Cryptomeria japonica* 'Compressa'; Japanese holly (*Ilex crenata*) cultivars 'Green Dragon', 'Dwarf Pagoda', 'Mariesii'; selected dwarf junipers and spruces; rhododendrons *fastigiatum, impeditum,* 'Chikor', 'Flame Creeper', 'Purple Gem', etc.

Low shrubs, perennials, alpines—mostly under 1′: *Aethionema* 'Warley Rose'; Columbine (*Aquilegia*) species; Irish-heath (*Daboecia cantabrica*); *Geranium dalmaticum; Hebe buchananii;* creeping lilyturf (*Liriope spicata*); pachistima (*Paxistima canbyi*); dwarf "andromeda" or pieris (*P. japonica* 'Pygmaea')—ultimately 2-3′; miniature Japanese meadow-rue (*Thalictrum kiusianum*); cowberry (*Vaccinium vitis-idaea*)—leaves differ in size according to the variety, *V. v. minus* being the smallest.

Very low growers and mat formers: *Alyssum montanum; Androsace sarmentosa; Arabis androsacea; Campanula cochleariifolia, C. portenschlagiana; Dianthus alpinus, D. pavonius* (*neglectus*); *Gypsophila cerastioides; Hedyotis* (*Houstonia*) *caerulea; Hutchinsia alpina; Iberis sempervirens* 'Little Gem'; *Iris cristata; Oenothera perennis; Potentilla verna nana* of the trade; *Saxifraga paniculata* (*aizoon*)—to 1′ or more in flower; *S. primuloides* of the trade; *Sedum dasyphyllum, S. nevii; Sempervivum; Thymus doerfleri.*

Bulbs: *Galanthus; Iris reticulata; Narcissus asturiensis, N. cyclamineus.* ⁂



M. Joyner

Lifting them off the ground gives them (and you) a better chance of success . . .

ELEVATED ALPINES

Francis H. Cabot

Raised beds and wall gardens are the essence of rock gardening. Not only do they enhance the chances of our succeeding with those beautiful and temperamental alpine species that have been wrenched from their mountain habitats and subjected to our inhospitable lowland climates, but their geometry lends itself to incorporation in almost any garden or backyard setting with a good opportunity for aesthetically satisfying results.

If they are built and maintained properly there is no limit to what can be grown, even by those of us who are new rock gardeners. To succeed, however, we must keep two points in mind during construction and planting; both relate directly to the way most alpines grow in their native haunts. 1) One can never have too much drainage in a raised bed or wall garden. 2) The soil mixture should be lean and gritty, a simulated alpine scree or talus slope with 75 percent coarse sand and chips. Let's examine these two points more closely.

In the mountains alpine plants are continuously drenched by melting snows or rains or heavy mists, and they thrive. Subjected to the same treatment in our gardens at lower elevations, the choicer plants soon give up the ghost and rot away unless there is good drainage. With the exception of bog plants, alpines cannot tolerate a soil that retains moisture and becomes saturated.

As a rule, in the raised garden give alpines an additional twelve inches of drainage material over and above what you think will be necessary. (Of course, the quality of your natural soil will have a

An elevated bed in the author's garden with plantings on top and sides is approximately 3½ feet high.

bearing on the amount of drainage required.) Gritty, sandy and well-drained soil causes little worry. But if there is clay, heavy loam or hardpan close to the surface, then you must excavate, removing the soil and replacing it with layers of small stones, pebbles and sharp gravel and sand.

Resist the tendency to use a normal soil mix. Most rock gardeners start with a mix suitable for delphiniums and end up using one that appears hopelessly deficient in any nourishment. In my own case, I have come to the point where no loam or "garden soil" is used at all. The soil mix consists of 75 to 80 percent sharp gravelly sand and 20 to 25 percent screened humus or rotted leafmold. If a plant has special requirements, then the appropriate material (limestone grit, or leafmold and peat) can be worked in where needed.

After all, you are not trying to grow cabbages but alpine plants, and if they have to search for nourishment with a deep root run in lean, gravelly soil there is a chance they will feel sufficiently at home to produce the kind of dazzling display that we associate with the alpine screes and pastures above timberline. And they will be more in character too! Even the easiest and rankest arabis or aubrieta will take on a certain compact elegance if properly starved and will avoid the inappropriate robustness that one normally associates with a cauliflower.

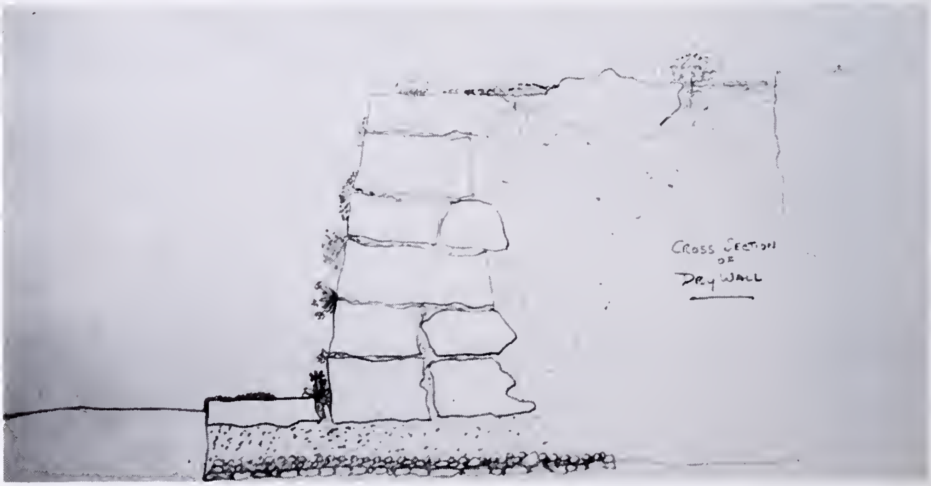
The ideal habitat for most alpine plants is a crack between two boulders some 2 to 3 inches wide and up to 5 feet deep. No wonder then that raised beds and wall gardens enable alpines to do their thing, for in each case they allow for good drainage.

Wall Gardens

In building a dry wall garden the principles are relatively easy to grasp, but the execution is difficult unless one has latent talent as a stone mason. A really well built, aesthetically satisfying wall that will last for posterity is not something hurriedly thrown together. The guidelines set forth below are exemplified in the accompanying sketch.

Construction. 1) The ideal rock for a dry wall garden is one that can be shaped with a mason's hammer into rectangular facing surfaces of 4 to 8 inches in height and any width greater than 6 inches. Avoid rounded glacial boulders and rocks that are less than 4 inches high.

2) For solidity and long life build a second dry wall directly behind the facing wall. In the English climate, where the ground rarely freezes more than an inch or so deep, a single facing wall is sufficient, but in most of North America it is woefully inadequate because frost may



Author

Note the batter (angle) of the wall face in the cross section of the dry wall. The batter helps to capture rain and gives better sun exposure to the inhabitants.

P. Frese

A rock wall adapted for a rock garden. Note how rocks tilt back for good drainage.

penetrate the soil deeply and dislodge the stones.

Since the second wall will be invisible, less work is required in shaping the stones, but they should be placed in such a way that they touch and are parallel to the facing stones. It is not necessary to carry the second wall beyond the penultimate row of stones. An occasional facing stone can extend back over the second wall, thereby tying the two walls together.

3) There should be a "batter" to the dry wall, that is a slight slope inward from the bottom to the top of the wall so there will be more stability and so rain will tend to enter the cracks between the rows of stones. The less "batter" the better looking the wall. A double wall allows for a more perpendicular result, with about an inch of "batter" per foot of height being adequate. A single wall will require 3 inches.

4) Each row of stones should be laid in a generally level fashion much as one would lay a row of bricks. There should be a slight slope downward from the facing edge so that the moisture will run into the soil behind the wall rather than away from it.

5) To minimize erosion, vertical cracks between facing stones should always rest on a solid stone foundation and not be in line with a vertical crack in the row immediately below.

6) A paved stone walk or coping at the base of the dry wall will do much to set it off, providing a good transition between the wall and the ground level as well as an opportunity to tuck in plants that would welcome this type of location. The stone for the coping should be identical to that used in the wall.

Planting. 1) Plant as early as possible in spring so plants root deeply into the soil before hot weather comes. Fall planting is risky.

2) The smaller the plant, given an adequate root system, the more chance it will take and the more chance it will fit neatly into the interstices between the rocks. Only enough soil to cover and encase the flattened roots need be placed between the rows of stones.

3) Assemble plants well in advance, making your own divisions or cuttings to enhance the supply. A wall will absorb many more plants than an equivalent square footage of flat ground, so be sure you have more than you think you need.

4) Overplant, since some of the plants will not make it and nothing is more frustrating than trying to establish a plant in a thin crack once the wall is built. Use chinks of rock in the cracks to support and contain the plant crowns, to prevent erosion, to separate species and to provide the maximum rock surface to the finished wall.

5) Choose your plants with a view to the exposure of the wall. For example, will it be hot and in full sun (*Achillea, Dianthus*), in part shade (*Campanula*), or north facing (*Saxifraga*)? If the wall has several exposures and you are in doubt about a plant's requirements, try the same species on each exposure to see which is best.

6) If you use a plant that tends to cascade down a wall face (*Aubrieta, Gypsophila* or *Phlox*), be sure that it has enough room to do so without covering a choice tight-growing kind beneath it.

7) Be bold and try some of the more

difficult species. There is far more chance they will grow in a dry wall than in the rest of the rock garden.

8) Remember that no matter how meticulously you tamp and pack the soil into all the cracks (and this is the cardinal rule in building a dry wall) you must expect some settling. It helps to wash down the soil with a fine spray under pressure for each row of stone as you go. Once this is done, leave the wall for a day or two, preferably in a soaking rain. It then can be repacked and tamped again, and you probably will have a better-settled pile of stone and soil.

9) Plant the bed on the top of the wall in character with the plants on its face. This also applies to the stones used in the top bed, which should complement the wall stone but which need not be rectangular. Generally, the larger the stones in the top bed, the more effective it will be, both aesthetically and from the point of view of conserving moisture.

Raised Beds

While constructing a dry stone wall is the most exacting way of raising alpines off the ground, the use of a raised bed achieves the same purpose, at least for those plants that are horizontal. There is a wide range of materials that can be used to construct the bed and much less time is needed to achieve the end result.

Wood. Cedar logs stacked three or four high in log-cabin style are one of the simplest of all arrangements. The logs should be at least 5-to-6″ in diameter and nailed at the joints. Any geometric shape is suitable so long as one can reach to the center of the bed.

Railroad ties are even better suited because of their bulk and rectangular shape. If you use old ones impregnated with creosote, line the inside of the bed with plastic to prevent root damage to the most sensitive plants.

Both logs and ties are particularly useful in creating raised horizontal beds on sloping ground. A hillside where it is difficult to garden under normal circumstances can be turned into an orderly and attractive series of stepped raised beds with a minimum effort.

The use of thick wooden boards to make a raised bed permits one to tie the bed more directly to the architecture of the house and gives one more flexibility in design. Plexiglass side panels and removable top panels can be built into the wooden framework to provide shelter for some of the more temperamental alpines from damaging winds or excessive rain. This device enables one to grow many of the Western Asian bulbs and some of the Western American alpines that require a thorough baking in the summer months if they are not to rot away in the damper climate of most of North America.

Troughs and Containers. "The shapes we make for ourselves and live by are primarily geometrical and the background of civilized life is more or less rectangular. . . . If we use a curve it is usually the exact and mathematical circle." (*Men and Gardens* by Nan Fairbrother.)

The classic trough garden is a case in point. A trough is nothing more than a specialized, self-contained, usually portable form of raised bed ranging in size from diminutive to immense with its shape up to the imagination of the maker. Troughs look particularly well when they are grouped and framed within a geometric setting. Alex Duguid lined them up in an allée, flanking the lawn in his Edrom Nurseries in southeastern Scotland. In the alpine house area at the Royal Botanic Gardens in Edinburgh, the troughs are placed on low blocks on paving and are framed on two sides by walls. In Sir George Taylor's garden at Dunbar, Scotland, his troughs are raised to waist height on blocks and framed by an old cellar foundation, now open to the skies and sheeted with vines and espaliered shrubs.

Troughs must either be made out of "hypertufa," a cumbersome process unless one plans to produce them in quantity, or purchased ready-made from one of the specialist nurseries. They are ideal for alpines and fit in beautifully in almost any setting. In addition to troughs, there are other ready-made containers that can be adapted satisfactorily for raised alpine bed treatment.

In a small space concrete blocks or chimney flues can be stacked in a pyramidal form in a way that provides adequate root run for the plants. Solidity can be a problem here, however.

Concrete well tiles are available from concrete products manufacturers and come in varying diameters and heights. A useful size is forty-eight inches in diameter and two feet in height. These tiles are usually made of reinforced concrete. Another readily available shape is the bottom half of a reinforced concrete septic tank some four feet by eight feet by thirty-two inches high. There are many other forms available in the trade from rectangular junction boxes of all sizes to immense concrete ovals used in highway construction. Concrete well tiles are considerably less expensive, given their size, than troughs and the variety of shapes can be combined in a number of interesting fashions. They are surprisingly easy to obtain from suppliers and can be delivered to one's garden.

Stanford White, the great turn-of-the-century architect, furnished the patios and courtyards of his elaborate houses and palazzos with sarcophagi filled with plants. In England one intrepid plantsman, Clarence Elliott, used a Saxon stone coffin for his choicest alpines, a huge planter still in use at his son Joe Elliott's nursery. The only limit to what can be used as a container is one's imagination.

If one is especially addicted to the idea of raised beds and wall gardens, one can combine the two and build a raised stone bed—in effect a multi-sided wall garden which offers the ultimate in planting space and exposures; or one can build a raised stone bed against the side of the house or around the toolhouse or greenhouse.

In summary, a raised bed or wall garden inherently provides that all-important drainage; brings the plants up to where one can enjoy them to advantage; is easy on the knees and sacroiliac (once it's built), and particularly appropriate for older gardeners or ones with physical handicaps; and can be easily introduced into the garden with generally satisfactory aesthetic results derived from its (almost always) geometric configuration.

A COLD FRAME FOR THE ROCK GARDENER

The usual cold frame is a glass- or plastic-covered box which is placed facing south, storing heat from the sun and warming the soil. It extends the growing season, giving an early start for vegetable and annual seeds and sheltering fall crops. The frame is also used to protect tender perennials such as pansies and for forcing plants such as bulbs into earlier bloom. This type of cold frame, useful as it is, requires much work, particularly the almost daily opening and closing of the cover in sunny weather.

Another type of cold frame, one facing north, requires less attention and is more convenient for the rock gardener. This can be a bottomless box of any size. It should not heat up in winter. Place it behind a wall or on the north side of the house. The frame can be used to winter over questionably hardy perennials, protect first-year rooted cuttings and seedlings, and force bulbs and perennials for spring display; also, to plant pots of fall- and winter-seeded perennials or to root cuttings of perennials and woody plants in summer.

Inside the frame: Make a 4″ layer of gravel, stones or broken crock, starting below ground level. This is for drainage. Then add at least a 4″ layer of sand. The pots should be placed rim deep in this layer. In winter after several frosts, add a 4″ cover of needles, excelsior or salt hay as insulation. The box should be protected with a wood cover or plastic film nailed to a frame, slanted to shed rain. During summer the box can be left open or covered with plastic (if rooting new cuttings). Watering rarely will be needed.

—*M.F.*

Roche

Mother-of-thyme on terrace

No hills in the backyard? Then experiment with . . .

ROCK GARDENING ON THE LEVEL

Donald E. Havens

Have you viewed the elaborate and beautiful rock garden in Longwood Gardens (Kennett Square, Pennsylvania), Queen Elizabeth Arboretum (Vancouver, B.C.), or the Royal Botanical Garden (Hamilton, Ontario), just to mention three of many on this continent? Or Edinburgh Botanical Gardens or Kew in the British Isles, or the countless others on the continent of Europe? Perhaps your travels have taken you to many beautiful home rock gardens in the United States. My mind travels to the ravine gardens in Ithaca, New York, and hillside gardens in Seattle, Washington. Have you trod the mountain trails of the Cascades in the Pacific Northwest? If you reside in the Upper Midwest, you probably have viewed the beautiful Kettle Moraine area of southeastern Wisconsin.

All of these places have one thing in common. Beautiful wild flowers were growing beside or trailing over rock outcroppings either created by nature or man.

Capturing the Essence

Many of us long to have a bit of this beauty in the sanctuary of our own home grounds. But how? Perhaps we have a 50 by 100 foot lot flat as can be, with much of it taken up by the structure of the house, garage and drive. Our soil may be hardpan clay from the backfill of house construction or so sandy it would cost a fortune to water the lawn sufficiently to have it green all summer. But take heart. You can grow many beautiful rock garden plants on level ground. I will deal with two types of ground-level gardens: pavement (or path) gardens and terrace gardens.

Pavement Gardens

The first order of business is to study as

Edelweiss *(Leontopodium alpinum),* a possibility for a well-drained level rock garden, has glaucous green leaves and woolly white flowers.

G. Taloumis

many books as you can, to plan carefully. Information on pavement design can be found in your public library with help of the librarian. The British writers refer to a type as "crazy" paving. I prefer the term irregular, fitted and non-fitted. Its perimeter should be compatible with your landscape and building design. Thus, it could be rectangular, and used as a patio. However, repeated curving lines are usually more pleasing to the eye than harsh square shapes.

Construction material in order of desirability: 1) two-inch-thick slate flagstones; if your soil is alkaline, limestone flags. In fact, any flagstone of uniform thickness you can get from your dealer is satisfactory. 2) concrete rounds with exposed aggregate. 3) wood, such as cedar rounds or untreated railroad ties, the latter sawed to six-inch lengths. Plan to replace wood as it weathers away in time.

Lay the flagstones evenly and solidly so there is no tipping when you walk on them. If your soil is heavy clay, remove it to a depth of 24 inches and fill with sandy loam. Make this foundation for your pavement garden in the fall. Let it settle until spring, then lay the stone. (I prefer the irregular fitted type pattern.) Leave no more than ¾" between stones, except for corners, which if square, can be broken off enough for a plant pocket. After stones are laid, brush a mixture of ¾

Roche

With delicate but profuse flowers, *Veronica repens* fills in between and over the rocks in low mounds.

sharp mason's sand and ¼ loam over the stones. The finished pavement should be about two inches higher than the surrounding ground level, and it should slope very slightly from front to rear, for most rock gardens require excellent drainage. If the location is in sun, use sun-loving plants, the opposite for a shady area. Use only tufted, bun or semi-trailing plants. Do not overplant. Plant in an orderly manner. Nature is quite precise in its own design. Strive for that result.

All the foregoing remarks regarding pavement garden construction and planting apply equally to a planted path. However, if you have differing grade levels on your property, you can have a terrace garden or gardens.

Terracing

Install a path between levels, learn about the kind of soil you have, and excavate and replace if necessary. Unless you can work on the garden from front and rear, make it no wider than 3 feet (6 feet if accessible from front and rear). This will make weeding and plant grooming easy.

There is more latitude of plant choice in the terrace garden than in the pavement. Suit your fancy after study. Insert a rock here and there to three-quarters of its depth or all of it below the surface and put plants preferring a cool root run next to it.

One final word. If your soil is predominantly alkaline, plant lime lovers. If acid, use acid-soil plants. If you must try these difficult plants with distinctly high or distinctly low pH requirements, resort to container or raised beds. (See Frank Cabot's article in this Handbook, p. 57.)

Here is a list of appropriate plants for paved gardens:

Acaena buchananii
Achillea argentea of the trade (probably *A. clavennae*), *A. tomentosa*
Androsace sarmentosa
Arabis aubrietioides, A. caucasica (albida)
Arenaria verna caespitosa
Armeria juniperifolia (caespitosa)
Astilbe chinensis pumila
Aubrieta deltoidea
Aurinia (Alyssum) saxatilis 'Citrina' or *A. s.* 'Lutea'. Soft yellow-flowered forms of basket-of-gold
Campanula portenschlagiana (muralis)
Dianthus gratianopolitanus (caesius). Cheddar pink
Dicentra 'Luxuriant'. Repeat bloom
Epimedium—in variety
Erinus alpinus
Festuca ovina glauca. Blue fescue
Leontopodium alpinum. Edelweiss
Mazus reptans
Petrorhagia (Tunica) saxifraga. Tunic flower
Phlox subulata. Moss-pink
Saxifraga paniculata (aizoon) and related species
Sedum sieboldii
Thymus serpyllum. Mother-of-thyme in various forms. Also *T.* x *citriodorus,* lemon thyme
Veronica armena, V. pectinata, V. p. 'Rosea', *V. prostrata (rupestris), V. repens* ☙

TAKE ADVANTAGE OF YOUR SITE

Some people will declare that the most important thing in building a rock garden is the site. I say no! If you have an area with sun and shade, great! If you don't have a choice of site and have to put your rock garden in full sun or full shade, then grow plants that will grow in sun and others that will only grow in shade. Remember that in an all-sunny rock garden plants requiring half sun or shade can be placed behind larger rocks and taller plants. You can always create shade in a sunny garden, but you cannot create sun in a shade garden, so grow plants for the site.

Don't try to fight nature—join her and you will be surprised at the results. True, you will not be able to grow all the plants you may desire, but the plants you do grow will grow well and reward you with their bounty of flowers. —*Paul Palomino* ☙

To each according to its needs . . .

SCREE AND TUFA GARDENS

Paul Palomino

The scree in my garden was built in the hottest spot, in full sun all day. This was done to accommodate plants that grow only in hot, dry sites throughout the world. Their roots are deep in the ground, in cool broken rock which provides the perfect drainage they need. These plants are not hard to tame if given such a site but will rot if placed in regular garden soil. A scree can be placed almost anywhere in full or half sun depending upon the plants you wish to grow.

A scree in nature is a collection of rock fragments, varying in size, found at the foot of a cliff, large rock or mountain. It is usually sloping and many feet deep and is stabilized by the plants growing in it. The plants are given a very small but, for them, adequate amount of nourishment by other vegetation which has rotted to form humus. This filters down to the roots along with the sand and finer rock particles in water draining through the rock fragments. A scree with water percolating from below is called a moraine.

I was willing to give extra attention to making a scree because of my fascination with plants from hot dry parts of the world. After clearing a site, I removed the soil to a depth of 3½ feet and filled the bottom with old slate, rocks and broken bricks. Added to this was a 4-inch blanket of half-rotted pine needles and partially decomposed compost. The upper 2 feet were filled with crushed road gravel (pea size), into which was mixed a very small amount of compost. On top was added a 3-inch-thick mixture of two parts sand, one part garden soil and one part compost, which would eventually filter down to the roots and give nourishment.

Very sandy soil was placed around the

Roche

A more-or-less hardy relative of the African-violet, *Ramonda nathaliae* from the Pyrenees, does well in the semishaded portion of the author's tufa garden.

B. A. Mech

A tufa mound built for the choicest and tiniest rock garden plants is shown here in early autumn.

roots of plants to encourage deep rooting, and plants were set high so they wouldn't be buried when a 4-inch layer of crushed rock was added as a top dressing. Larger rocks were carefully placed to offset a few 12- to 14-inch shrubs that were added for scale. These rocks also shaded certain plants and gave cool root runs. The scree was built in the shape of a "U" with a 14-inch cliff of boulders retaining soil where conifers were placed. The total area is 12 by 20 feet.

The scree has served as home for a number of plants that are not easy to cultivate, including among others certain species of *Eriogonum*, *Oxytropis*, *Potentilla*, *Penstemon*, *Polemonium*. *Astragalus*, *Lewisia*, *Phlox* (western), *Arabis* and *Aquilegia*.

A Tufa Mound

Tufa is a lightweight porous form of limestone resulting mainly from precipitation from mineral springs of calcium and magnesium carbonates, with traces of aluminum, silica and iron. It is used in various ways, including as a substitute for stone in the rock garden, as a potting-mix ingredient, and as a planter.

I chose tufa because it is porous rock which holds moisture and on which a plant will grow if placed while still a seedling in a small hole. Seeds which find their way into a crack or hole will also grow. Tufa may look stark at first since it has no strata, is light in color, and is rather lumpy. It soon softens in appearance as plants and moss begin to cover it. Tufa seems to meet the needs of a variety of plants regardless of their natural requirements.

The alpines from the higher mountain areas that are placed in my tufa mound are there because they require special soil with perfect drainage which still retains moisture during hot dry periods. These conditions make them hard to raise in the average garden. In fact, some plants in the mound grow far *too* easily because the growing conditions are exactly to their liking. They have to be thinned as they reseed themselves, to make room for other less enthusiastic plants.

My tufa garden is 20 feet long, 15 feet at its widest point and 4½ feet high. The soil mixture for the mound consisted of 3 yards of builder's sand, 1½ yards of leafmold from beech trees, 8 bales of peat moss and a yard of loam. The mixture was compounded on the acid side to counteract the alkalinity of the tufa. Larger soil lumps were broken by hand and the mixture turned over without sifting.

As the mounding of the soil began, so did the careful placement of tufa. This was a slow process, for my aim was to make a mountain in miniature. Each piece had to be firmly embedded so it could be walked on when I went to view plants in any desired area. After the mound was completed, but before plants were set out, a hose was run full force on the hummock to locate any waterways, which were then plugged with rocks. Planting started with dwarf conifers to complement the tufa and in the scale of the mountain.

One part of the mound is in full sun until late afternoon, another receives half shade. The following plants, most of which would be difficult for me to grow well otherwise, are performing nicely in the sunny ares: *Aquilegia jonesii, Draba polytricha, Erinacea pungens, Eriogonum* species, *Gypsophila arietiodes* var. *caucasica, Phlox* (western species) and *Vella spinosa*.

The plants that have been successful in the half shaded area include: *Androsace* species, *Campanula lasiocarpa* (rambunctious, as are many other bellflowers in tufa), *Daphne alpina* (but not *D. arbuscula*), *Dryas drummondii, Gentiana* species, and two relatives of the African-violet—*Haberlea* and *Ramonda;* also *Lewisia cotyledon* (but not *L. tweedyi*), *Primula auricula, P. marginata* and European hybrids, *Saxifraga* and *Soldanella* species. My favorite of all is *Phyteuma comosum,* a prickly member of the Bellflower Family with striking flowers. It is growing in a large, split rock. One spring it had ten flower heads.

After the miniature mountain was planted it was topdressed with 4 inches of gravel, which was also worked into the top 8 to 10 inches of soil and in the holes in which the plants were placed. The mountain is maintenance-free except for weeding out plants that self-sow too much. This may sound strange but it is a fact. I hope you will be so lucky if you build a mountain! ☘

A GARDEN OF SAND

Are you challenged by the difficult plants? Some rock gardeners will go to considerable length to grow them well. Professor Norman Deno, in an article titled "Gardening in Sand" (*Bulletin of the American Rock Garden Society,* Spring 1980), suggests the following kind of raised bed that will succeed with certain deep-rooted plants. In a reasonably level area, where the prior removal of only the most vigorous weeds may be necessary, spread a 6-inch layer of coarse builder's sand. Twelve cubic yards is enough for an area 25′ x 25′. Then plant.

One reason some plants do so well in the sand bed is good soil aeration. Deno says, "Plant roots, as growing organisms, get energy from oxidation-respiration and they need air, or more specifically the oxygen in the air. If they cannot get oxygen, they die of asphyxiation just as surely as an animal. Many gardeners achieve this aeration by striving for what they call drainage. The truth is that the roots of plants really don't care whether water flows past them fast or slowly: however, misconceptions sometimes work and soil with good drainage will be well aerated, even well below the surface." Or, as one old rock gardener put it, good drainage never hurt anything but a sphagnum bog. Sand beds are also easy to weed, and plants don't heave in winter.

Plants that can be grown in the sand bed include western phloxes *alyssifolia, andicola* and *hoodii,* as well as the eastern *subulata* and *bifida*. It also works for some penstemons, arenarias and eriogonums, and hardy cacti such as *Echinocereus pectinatus* and *E. baileyi*. The beautiful Onocyclus and Juno iris are among other plants which also thrive. ☘

ALPINE HOUSES AND SUN PITS

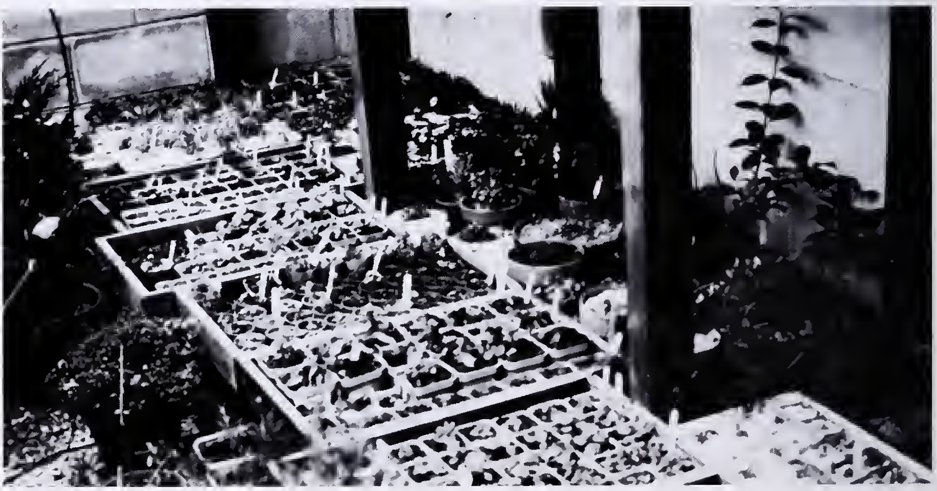
Lee M. Raden

This specialized form of "confined microclimate horticulture" is fascinating, time-consuming and sometimes frustrating. However, patience is often rewarded with magnificent specimens of plants that are impossible to grow to horticultural perfection outdoors. Some 85 percent of the alpines that are grown in alpine houses and sun pits will do very nicely in cold frames. The disadvantage of the cold frame, though, is that we cannot walk into it to observe the plants' needs. For perfect specimen plants there must be absolute control of temperature, light and humidity. This is available in alpine houses and sun pits.

In this age of severe energy problems, for most people a greenhouse is sheer luxury. Alpine houses and sun pits, because of the minimal heating requirements, can answer to energy saving with their very low cost. My alpine house is 20 by 10 feet. It is a modified glass-to-ground lean-to with propane as its energy source. The heating bills for the last two years have been only about $150 per year.

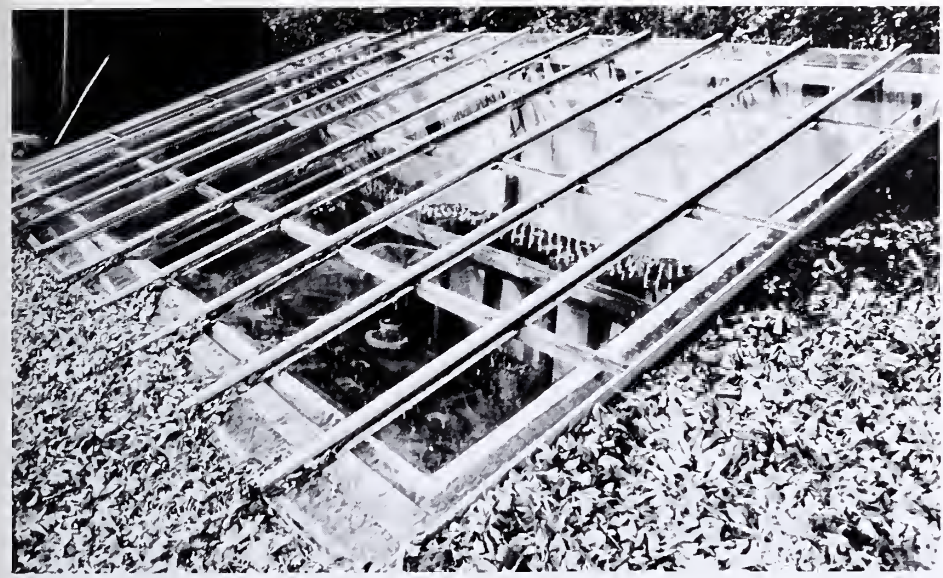
The viewing and sharing of a collection of alpine plants out of the weather, with humidity and temperature control, and proper shading, is to me one of life's greatest pleasures.

There are a number of guides we must follow in this form of gardening. The first is proper ventilation. While English growers open their alpine houses to all sorts of drafts, with side louvers, under-the-bench louvers and end louvers, I feel that proper ventilation consists of intake at the low end of the alpine house or sun pit and exhaust at the opposite corner as high as possible. This is done with high-speed exhaust fans that should exhaust the total area at least every minute, and preferably every half minute. The fan should be thermostatically controlled; this will create the proper buoyant atmosphere in winter that the plants need for correct dormancy. The thermostat should keep the exhausting air about 50°F and the cut off about 40°F. It has been my experience that standard ridge greenhouse ventilation should be closed, as it only short-circuits this movement of air that is so necessary in winter. Night-time temperature should be maintained at 35°F by an energy source. This forces most al-



A variety of potted plants and seedlings, too young or too tender for outdoors, thrive in an alpine house.

Photos by author



Construction of an alpine house can be very simple yet meet the requirements of the plants. Position of the house and ventilation, however, are crucial.

pines into winter dormancy. Thus, the strange but wonderful phenomena, "the plant wake-up mechanism," is not initiated until the last week in February in the Philadelphia area.

Shading and Air Circulation

Suddenly, the plants take on a new appearance. New growth and swelling of buds tell us to raise the night temperature to 40°F and keep the daytime temeprature in the 50's. By April, shading is necessary. At one point, I had high shading of ash trees, which was perfect. However, with my present alpine house completely exposed to the south, I use 63 percent shade cloth. The shade cloth is approximately 12 to 15″ above the glass and is

A vast number of seedlings and cuttings may be fitted into just a corner of the house.

never allowed to touch it. This is an important consideration as it allows circulation of air under the shading material and, therefore, brings about a much lower greenhouse temperature during the mild months. It is removed in November.

Air conditioning is the perfect humidity control for alpines from May through October, but it is just too high a price to pay these days. The shading I have desribed takes care of the summer needs of 75 percent of the alpines.

The most difficult alpines to keep alive in our climate are the ones that suffer the most in the summer: *Androsace, Saxifraga* and *Primula*. In most cases the alpines from higher elevations can't take humidity because the stomata become moisture-engorged and the plant rots. A shaded alpine house or pit with a steady current of air blowing over the plants creates an evaporation shield that lets the plants limp through the hot days of July and August. Limp through they do, and with this technique there is a resurgence of growth in the plant that I never observed outdoors. They go into their winter rest full of vigor.

I do not remove plants from the pit or alpine house in summer. Since we are dealing in an artificial climate with plants in containers we must, by observation, learn where to place the containers in summer and in fall. Whether it be a pit or an alpine house we learn to live with it and enjoy it. Only by keen observation can we successfully bring alpine plants to their horticultural perfection.

Further Readings

Winter Flowers in a Sun Heated Pit, Kathryn S. Taylor and Edith W. Gregg (Charles Scribner and Sons, New York)

Weatherwise Gardening, (Ortho Book Series, San Francisco)

Alpine House Culture, G. Anley (Country Life Ltd., London) ❧

THE ART OF PLACING DWARF SHRUBS

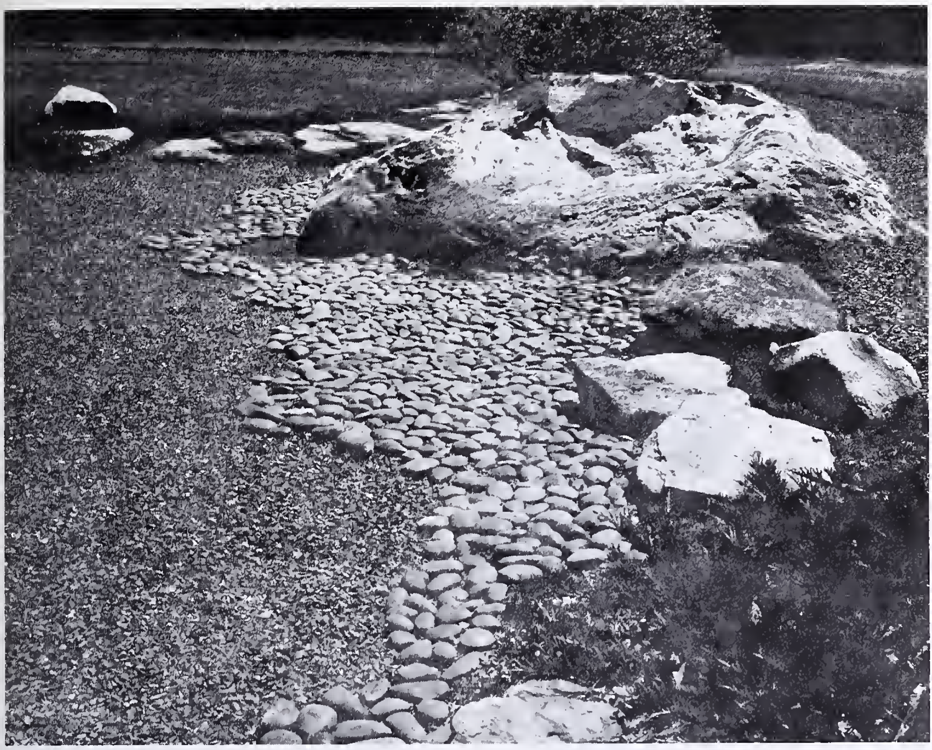
Rex Murfitt

Suppose a fence were placed around a few square yards of mountainside and the mixture of plant forms were studied. There would be a balance—a few conifers, some broad-leaved evergreens, a deciduous flowering shrub or two, plus some typical alpine flowers. These are our guidelines: variety, informality, balance and scale. We do not want to copy a specific piece of mountainside, but the mountainside can teach us.

Tall forests are always at lower elevations. They surround the base of mountains. Trees become smaller and more shrubby as they ascend the mountainside, finally becoming low and prostrate before they disappear entirely, giving away to pure alpine vegetation. There are exceptions such as an odd pine, twisted and stunted, clinging to a ledge or crevice at elevations where no tree should rightfully be. The gardener can express his talents by adapting these natural formations to his garden. This is the plan we must follow if our dwarf trees and shrubs are to fit the scale of our garden.

I have already mentioned nature's planting of taller treelike forms at the lowest point. An illusion of this in the garden can be achieved by carefully grouping a few together where they will suggest forested slopes. Do not overdo it. The suggestion is enough.

As we reach the ultimate elevation of the garden the smallest possible types are used, little domes or completely flat varieties of spruce, false-cypress, fir, juniper. There are so many lovely plants to use that filling the garden will be no problem, quite the opposite in fact. So, if we are choosing shrubs to create illusion let us plant those that at least look like woody plants. Let us see some woody stems, some branch structure, a feeling of solidarity and permanence to set them apart from the other plants that compete for attention. ❧



H. Ganner

Rocks may represent waves,
foam and seacoast

For a higher aesthetic purpose, study . . .

THE JAPANESE USE OF ROCKS

Iza Goroff

The Japanese have designed gardens with rocks for many centuries. The purpose and principles of the Japanese garden are different from those of the western cultures. Although Japanese gardens are unlike western gardens, they are not opposite, and it is possible (and desirable) to incorporate some of their ideas into the American rock garden. The Japanese garden is primarily a work of art, designed to produce emotions or a philosophical or religious state in the observer. The elements used are similar to those employed in the western art of painting. Rocks are chosen for their formal artistic properties. Each rock is considered to have an intrinsic quality, a feeling, and an extrinsic quality, how it relates. A low, wide rock projects the feeling of stability and peace. It relates to rocks on either side of it. A tall, pointed rock evokes excitement. It does not point to other rocks, although other rocks may point to it. The tall, pointed rock takes the observer's eye from the garden and leads it towards the sky. In one Japanese book on gardens there is a classification of nineteen different rock forms, each with its own name.

A plant's role in the Japanese garden is

Rough stone bridge over smooth stone "stream" in a Japanese-style garden.

very different from that in the western garden. The plant, like the rock, is used primarily for its formal artistic properties. The plants selected fall mainly into two categories, specimens and carpeters. The specimen plants are categorized, like the rocks, according to their shapes. But a plant may be chosen and trained to represent a heightened effect of nature on its life. For example, the effect of wind on a small tree might be shown by the trunk bent by the (possibly non-existent) wind with almost all of the branches horizontally pointing with the wind. The effect of age might be represented by a tree with gnarled branches and jagged dead wood; or, perhaps by a straight tree with a relatively thick trunk at its base, tapering rapidly as it rises. These ideas are brought to their culmination in the Japanese arts of bonsai and saikei. The qualities used are those which are universal, yet those which are expressed in the individual plant, not necessarily qualities of the species. ⁂

Photos by H. Ganter

Stones with crushed gravel between them prior to planting. Note both the overall curves and the random nature of the individual placement.

For rare and treasured miniature narcissus, crocus, iris and others, grow them in . . .

THE BULB FRAME

James MacPhail

The progression of rock gardener from neophyte to skilled practitioner is marked by at least two milestones. First comes the euphoric period of discovery when enthusiasm leads to the growing of every rock plant that can be acquired. Next comes the realization that time, energy and garden space are not infinite and that, anyway, certain kinds of plants are preferable to others. In other words, the gardener is on his way to becoming a specialist.

If the area of specialization happens to embrace a group of plants that thrive in the climate of an open garden all is well and good. If on the other hand a group is chosen that for the most part will not do so, the gardener will have to take steps to modify his climate to suit the plants. One choice is to raise plants in pots in a cold frame or alpine house. Growing in pots is an ideal method of dealing with certain "difficult" alpines. But not all of them. Bulbs, for instance.

Once one has experienced the delights of growing in the open garden those dwarf bulbs that will thrive there, it is hard to resist the urge to grow more of them. This pursuit inevitably leads to searching out others, and it soon becomes evident that many of the choicer kinds are not—alas—amenable to the open garden. To accommodate them the bulb frame has evolved.

What Is a Bulb Frame?

In essence a bulb frame is a bed raised to provide the sharp drainage most bulbs need. It is surrounded by a low structure which retains the soil. A cover provides protection from the weather while admitting enough light and air for the plant's welfare. The bulbs are not confined to pots but are grown right in the soil mixture in the frame. Such raised units are practical in parts of Canada and the United States where winter is not severe. In unusually cold areas an excavated frame, with appropriate drainage, is a safer choice.

There are advantages to this method of cultivation. The greater root run and nourishment in the frame produces plants that are faster growing, sturdier, and in general more resistant to pests. Plants also increase more rapidly; in fact the frame is used by nurserymen for propagation. Bulbs in the frame also have greater frost protection than those in pots, particularly if the pots have to overwinter in the shallow staging of a poorly heated alpine house. Finally, the bulb frame is a labor-saving device, eliminating the chore of annual repotting.

Let us also note some disadvantages of frame cultivation. Primarily, plants are no longer "portable," so they can't be trotted off to a local garden club show, nor can they be used for indoor decoration. Moreover, when it comes time to divide the bulbs or sort out the tiny bulblets that are produced, the task is more difficult than simply turning out a pot and sifting the contents through a screen.

For Utility or Display

The utilitarian approach can perhaps best be realized by starting with a commercially available wooden frame complete with the usual type of glass Dutch lights and sash bars. It will be necessary in this case to add to the depth of the frame as the bulbs need a minimum of 18″ of soil. Here in Vancouver, where winters are fairly mild, this extra depth is gained by building the frame up above the ground or by digging down below grade level.

The ability of the subsoil to conduct surplus water away from the frame is a factor to be considered. If there is any doubt, the frame should be built entirely above ground. In either instance at least a 6″ layer of drainage gravel should be provided at the bottom of the soil mixture. In extreme cases it may be necessary to install drain tiles.

Making It Attractive Yet Practical

If a showcase frame is desired, ingenuity will be needed. Masonry construction is the first choice, particularly if it can be a type that will match existing nearby masonry work. Many people react poorly to the presence in a garden setting of unnatural material such as glass or plastic. To avoid this, position the frame out of prominent sight lines because the frame lights will be in evidence for a good part of the year, though not, fortunately, during the peak flowering period. Furthermore, a spot for the frame should be found that allows it a maximum exposure to sunlight and a minimum exposure to wind.

This brief discussion is not intended as a nuts-and-bolts treatment on how to build with masonry. There are books on the subject for the do-it-yourselfer. My own experience has been limited to the use of concrete blocks, which go very easily once the hardest part, the concrete footing, has been poured.

As for the frame lights, one has two choices: glass or plastic. Glass breaks easily; plastic doesn't. Glass lights are heavy and awkward to handle; plastic lights do not weigh much and are easy to lift. (They are so light they may have to be tied down against the wind.)

A good, simple frame can be made with corrugated fiberglass panels. They don't have quite as much light transmission as glass but are used only when the bulbs are, for the most part, dormant beneath the surface of the soil. These panels do not have a surrounding wooden framework. They are simply cut to the required length and fitted into wooden channels at either side of the frame. The channels should be constructed to allow rainwater to escape outside the frame, not inside it. The length of the panels is such that they bow outward slightly and are held in place by their own spring tension. Successive panels are applied so they overlap each other by one or two corrugation widths. A frame properly covered with these panels should not leak a drop. Its form is like a long shallow tunnel with open ends. These ends are normally left open for ventilation, but in very cold weather they can easily be closed with burlap sacking. Further ventilation can be provided by removing any required number of panels in good weather. If the frame is subjected to severe winds, tie the panels down with a rope running the length of the frame, otherwise they could end up in the neighbor's garden.

The bottom of the frame is filled with six inches of drain rock or gravel. On top of this should be placed a layer of well-rotted sods or some other coarse weed-free material to prevent the soil mix from working down into the gravel.

Soil, Plants and Care

The soil mix that is almost universally recommended for bulbs in cultivation is made up of equal parts of loam, coarse sand and leafmold (or peat moss). To this we add a liberal amount of coarse bonemeal at a rate of about three pounds per cubic yard of mix. There is no need to be dogmatic about the exact proportions, however, because bulbs as a group are not fussy as long as the soil is well drained. This mix is suitable for the vast majority of species. Some bulbs, though, are gross feeders, notably Juno and Onocyclus types of iris. These appreciate a liberal amount of well-decayed manure, mushroom manure especially, worked into the soil at a depth of a foot below them. If many of these are grown, provide one part of the frame with this extra rich soil. Always keep manure well below the bulbs, otherwise the moisture retentivity of the manure could cause rot.

In most areas October is considered the optimum time of year for planting bulbs. It makes no difference if they are planted in the frame in summer, though, as the soil is usually bone dry at the time. If the bulbs are received so late they cannot be planted until winter, they will suffer a setback and not reach full potential for another year.

Management of the frame lights depends to some degree on the local climate. In Vancouver we remove them during the first half of October. The autumn rains at that time signal the bulbs that it is time to get cracking for another season.

After a good soaking the lights are put back and kept in place until the middle of March, when most bulbs are showing new growth. The very early bulbs, some of which flower as early as January, are confined to one end of the frame. The lights are removed from this section during any mild spell in winter. From the middle of March until about the middle of July the lights are completely removed. They are put in place again for the summer months so rainfall won't interfere with the required dormancy period. Watering is seldom needed here.

Feeding should not be necessary for the first three or four years, thanks to the large amount of bonemeal in the mix. After that the frame is given an annual topdressing of bonemeal in the autumn, which is washed in by the rains.

The best time to lift the bulbs is just after they have gone dormant but before their foliage has completely withered. This enables them to be located easily. The tiniest bulblets are best grown on in pots for a year or two. This is a much faster method of propagation than by seed, which in some cases may take five to seven years to produce flowering-sized bulbs. More often than not, though, the only way to acquire rare new plants is by seed. If seed is sown annually a point is soon reached where there is always something new coming into flower each year, so the long wait is not intolerable.

THE AMERICAN ROCK GARDEN SOCIETY

The scope of rock gardening is wider than that of any other branch of horticulture: the variety and number of available plants are endless. To many practitioners, rock gardening does not even necessarily imply the use of rocks and stone, but deals basically with the cultivation of wild or native species of plants. These may be annuals, biennials, perennials, shrubs or bulbs from the mountains, bogs, woodlands, heaths, prairies or arid plains of any continent. The objectives of the American Rock Garden Society, which has 3,500 members in the United States, Canada and overseas, have been to encourage and promote: (a) the cultivation, conservation and knowledge of rock garden plants, their value, habits and geographic distribution; (b) interest in good design and construction of rock gardens; (c) meetings and exhibitions; (d) plant exploration and introduction of new species and forms; (e) study of history and literature on the subject; (f) acquaintance between members and groups with the resultant mutual exchange of experience and knowledge.

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An annual meeting with garden visits, lectures and a plant show is held each year in a different part of the United States. Local chapters (eighteen at present) in various parts of the U.S. hold regular meetings with lectures, workshops, garden tours and plant sales. Readers of this handbook are invited to join the American Rock Garden Society and one or more of these chapters. For information, write to the Secretary, ARGS:

Donald M. Peach
Rte. 1, Box 282
Mena, Arkansas 71953

(*Note:* After 1980, please consult the latest ARGS *Bulletin* for current name and address of Secretary.)

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W. B. Flook

Chrysogonum virginianum

AN INVITATION TO JOIN AND ENJOY

A man does not plant a tree for himself;
he plants it for posterity.
—Alexander Smith

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are $15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to PLANTS & GARDENS, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

..................cut off here..................

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BROOKLYN BOTANIC GARDEN RECORD / PLANTS & GARDENS

GARDENING UNDER LIGHTS

Basic Techniques/Choosing Light Systems
Best Plants to Grow Under Lights
Roses, Ferns, African-Violets, Others
Propagation/Growing from Seed

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BROOKLYN BOTANIC GARDEN RECORD
PLANTS & GARDENS

GARDENING UNDER LIGHTS

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Fran Finkbeiner

The fern garden of a noted indoor light gardener is rich in tone and texture.

Letter from the Brooklyn Botanic Garden

Indoor gardening has had its ups and downs in recent years. First, there was the house-plant boom, the intensity of which surprised even Botanic Garden staff members, who have witnessed their share of fads. A BBG Handbook titled *A House Plant Primer* was issued, and the first printing was exhausted in record time—one week. Many people who had never gardened before suddenly possessed botanic gardens of their own, in their own living rooms. This was great, except for one thing. The plants, or at least a good number of them, languished and died because their new owners didn't know how to provide the proper care. Sometimes the plants just weren't adapted to indoor living. Then, inevitably, house-plant-backlash set in, and a number of neophytes turned to other pursuits: jogging, skydiving, collecting old comic books.

Fortunately, a balance of sorts between growers and plants was restored. A number of the then-new indoor gardeners persisted and became seasoned veterans. In the process they learned that there are limitations on how plants can be grown well indoors. One of these major limitations has to do with light, and it became clear to everyone that a plant couldn't be grown just anywhere in the home with natural light. Life has its north windows.

Gardening under artificial lights is one of the great liberators for the home gardener. The person who is strongly interested in indoor growing usually turns to it, for one can regulate precisely how much light a plant receives. There are side benefits, too. Plants are together, facilitating watering and insect control—sometimes. Most serious collectors now grow plants no other way.

The growing of plants under lights is as easy or as technical as one cares to make it. There are, however, certain ground rules that every home grower should know. In this respect, the Botanic Garden is fortunate in having one of the leading experts (we hesitate to say lights) to explain the basics of this fascinating field—Jack Golding. Let us extend a warm word of thanks to Guest Editor Golding and the fine group of Contributors he has enrolled to provide the essential information.

Why not get started this season? You will never regret it. And Happy Gardening!

Sincerely,

Frederick McGourty

Editor

L. Stephenson

Pool and bronze cranes in a light garden

QUESTIONS AND ANSWERS ABOUT LIGHT GARDENING

Irene Ebert

What can I grow under artificial light?

Any plant can be successfully grown under artificial light, as long as enough light is provided, and assuming the plant's other needs are met.

How far from the lights should plants be?

That depends on the type of plants you are growing. Plants requiring full sun conditions will need multiple tubes and should be placed quite close to the lamps. "Shade" plants are frequently grown under two-tube fixtures or at the ends of multiple tube fixtures.

How long should I leave the lights on? Must the lights be on all the time?

That also depends on the type of plants being grown. Twelve to fourteen hours of lighting per 24-hour period is a good starting point; you can experiment with shorter or longer light periods from there and observe the results. Although experiments have shown that continuous 24-hour illumination increases the growth rate for certain seedlings, this practice is harmful to mature plants. The photosynthetic process requires a dark period to enable the plant to convert to food the compounds it has produced during the light hours.

Do I need special "grow" lights? Which tube is best?

Many light gardeners have found ordinary cool-white fluorescent tubes to be as efficient as any other type for all varieties of plants. Others report better results when cool-white tubes are used in combination with others. Some of the special "grow" tubes enhance bloom or foliage color to the eye and have aesthetic appeal. Keep in mind that lighting alone does not fulfill the plant's needs—temperature, water, humidity and fertilizer must all be in harmony with the amount of light supplied in order to produce a successful specimen.

Must a portion of the light come from incandescent bulbs?

No. Incandescent bulbs generate excessive amounts of heat in addition to being a relatively poor light source. Fluorescent tubes are much more efficient in energy usage and supply virtually all of the plant's lighting needs.

Where can I buy tubes, fixtures, and shelving?

Inexpensive fluorescent fixtures are available at hardware, discount, and electrical supply stores. These stores also carry standard cool-white tubes, and some carry special "grow" tubes from various manufacturers. Shelving can be as simple or elaborate as you wish; completely self-contained multi-tiered "light carts" are available from specialty stores or by mail.

Can I grow vegetables under lights?

Yes. However, it is not practical from a cost standpoint to produce an edible "$10 head of lettuce." It's wiser to use your light garden to start your own seedlings for outdoor planting. This may or may not be cost-efficient, depending on price and availability of seedlings in your local markets. But it does give you the opportunity to raise preferred varieties not locally available.

Is light gardening expensive?

The cost of operating a light garden is a matter of choice and personal finances. Some indoor growers are satisfied with a few fixtures and a small variety of well-grown plants; others build extensive light gardens, even converting entire basements into indoor greenhouses. The only fixed cost is the price of electricity in your area. A call to your local power company will give you the applicable rate, and you can calculate the wattage requirements yourself. Wattage is printed on each tube. A four-foot fixture holding two 40 watt tubes will require 80 watts to operate, plus 10 watts to operate the ballast inside the fixture. Multiply the total wattage of your fixtures times the number of hours per day the lights are on, then multiply the result by 30 to calculate the wattage used per month. Divide the answer by 1000 to obtain the number of kilowatt hours (KWH), and multiply the answer by the prevailing electric rate. A four-foot, two-tube fixture operating for fourteen hours per day will use 37.8 KWH per month; if the rate is 5¢ per kilowatt hour, the monthly operating cost of this fixture would be $1.89. ❧

B. Howard

A light garden for seed propagation placed under a flight of stairs in a cool basement.

GLOSSARY OF LIGHT GARDENING

Jack Golding

BALLAST: A current and voltage regulating device necessary for starting and operating electric-discharge lamps. It gives off considerable heat.

FLUORESCENT LAMP: A low-pressure mercury vapor electric discharge lamp in which light is produced when the fluorescent powders (phosphors) are excited by the ultraviolet energy produced by the electrical discharge.

FLUORESCENT LAMP TYPES:

Commercial lamps: Used for the general illumination of offices, factories and homes. Designated by the generic names: daylight, white, cool white, warm white, deluxe cool white and deluxe warm white.

Plant Growth lamps: Lamps designed to emit primarily the blue and red colors in the amounts absorbed by plants for the chlorophyll synthesis, *e.g.*, Gro-Lux.

Wide Spectrum lamps: Improved plant growth lamps that have added emissions in the ultra violet and infrared ranges, plus some mid-range colors, yellow and green, to improve the aesthetic appearance of their light, *e.g.*, Gro-Lux, Wide Spectrum, Agro-Lite and Vita-Lite.

Full Spectrum lamps: Lamps that emit light approximating the spectrum of sunlight, *e.g.*, Naturescent, Tru-Bloom.

FOOTCANDLE: The (English) unit to measure the light received on a surface.

ILLUMINATION: Intensity of light per unit area.

INCANDESCENT (FILAMENT) LAMP: A lamp in which light is produced by a filament heated to incandescence by an electric current.

LAMP (also BULB or TUBE): A man-made source of light, also used to denote sources that radiate energy in the regions of the spectrum adjacent to the visible, *e.g.*, ultraviolet lamps.

LIGHT: The visible radiant energy.

LIGHT METER: An instrument for measuring the illumination on a surface. Usually color corrected to "see" the same colors as the human eye. Special meters can measure the light significant for plant growth in a spectral region of 400 to 500 nm., 600 to 700 nm. and 700 to 800 nm., (nm.$=10^{-9}$ meters).

LUMEN: The unit to measure the light emitted from a source.

LUX: The international (metric) unit to measure the light received on a surface.

PHOSPHORS: Fluorescent powders that coat the inner wall of a fluorescent lamp. The chemicals in the powders can be blended to produce light of any single color, or combination of colors.

QUALITY OF LIGHTING: The color characteristics of light. This can be illustrated by the spectral power curve of each type of lamp.

QUANTITY OF LIGHT: The amount and duration of light emitted (in lumens), or received on a surface (in footcandles).

SPECTRAL POWER CURVES: Charts that show the quality (color characteristics) of a lamp by a curve depicting the radiant power of each of the colors emitted.

SPECTRUM: The bands of color of the radiant energy that are visible and adjacent to the visible. The visible colors with their wave lengths are: violet 380-430 nm., blue 430-490 nm., green 490-560 nm., yellow 560-590 nm., orange 590-630 nm. and red 630-700 nm. The invisible adjacent colors are: ultraviolet 10-380 nm. and infrared 750 to 10^5 nm.

WATT: A unit to measure the amount of electricity used by an appliance. The sizes of lamps are specified by the watts consumed.

L. Stephenson

Author's light garden in the living room

Not just collections of plants . . .

SMALL INDOOR LANDSCAPE GARDENS

Libby Stephenson

A small garden can appear any place in the home as a collection of potted plants growing happily together in an attractive container with fluorescent lights providing controlled sunshine. Such a garden is a miniature landscape for all seasons of the year—a local paradise with minimum maintenance.

So where would you like a garden? Survey your home. Are there any dark places where a small garden could become a bright spot? Consider a garden on a bookshelf, a windowsill, a countertop in kitchen or family room, an entrance hall or room divider, an unused fireplace, a built-in cupboard or even an old TV cabinet. Use your imagination and see what you can devise. Be sure to hide the mechanics so all you see is a beautiful garden. And don't plan to install gardens all over the house or you will lose time with their care. Create a lovely scene and learn how to handle it. Daily observation will be your best teacher.

Location and Mechanics

In selecting the location, bear in mind that dark walls absorb the light while light walls reflect it. If the bookshelf garden is against dark paneling install a mirror behind it which will not only reflect the light but double the image of the garden. I once papered a bright kitchen with white brick wallpaper. The plants in the half-baskets hung on the bright wall literally espaliered themselves reaching for the reflected light!

Many of us have a large collection of

Contact paper covers galvanized trays in this kitchen-counter garden. Single-tube fixtures in a sunny kitchen make plants thrive.

plants in assorted pots and saucers. Plan to hide all this miscellany in one large good-looking container. This can be made of wood, plastic, plexiglass, galvanized sheet metal or whatever material you wish. The container should be at least five inches high to hide a 4″ pot; the shape will depend on its location. One very attractive fern garden in a triangular open terrarium made of plexiglass is tucked in the corner of a kitchen counter. Attached to the cupboard above is a single small fluorescent tube providing enough light for a fern or low light garden.

Containers must be waterproof. If you use a wooden box, line it with heavy plastic mitred at the corners and stapled on the top inside edge. To hide a galvanized tray, paint it to match the decor, cover it with contact paper or hide it behind a strip of wood or a piece of grating of the type used on stereo speakers.

Most indoor gardens need higher humidity than homes provide. For the small garden, dampened sphagnum moss, which absorbs ten times its weight in water, not only helps raise the humidity but hides the pots as well. Soak the moss in warm water, wring it out well, and use it to fill the container. Sink your pots into the moss. Each plant in its own pot can then be fertilized and watered according to its own needs, with excess water being absorbed by the spongelike moss. The buried pots do not dry out as quickly, which means a minimum of watering and only an occasional misting to freshen the foliage. Water the moss to keep it moist but not wet. If the moss tends to sink down a bit, more can be added. About every six months, remove the plants and apply an all-purpose plant spray, should you be a believer in "preventive medicine."

Fluorescent tubes with the full spectrum for natural-looking light are the answer for garden sunshine. Use a timer for easy control or, if natural light is available, use the artificial light on dull days or to extend the daylight. Just remember that plants grow toward the light; if the light is directly above, the plants do not have to be turned for even growth. Shallow double-tube fixtures with built-in reflectors are available in all lengths. These should be hung six to ten inches above the plants. To get maximum light, use the longest tubes that fit the space. If you cannot hide the fixture, get one with a woodgrain finish. The fixture can be attached to telescopic legs or hung with chains or nylon fishing line. In a fireplace, a double tube fixture may be placed up out of sight for a garden of low light plants.

Some years ago, in an effort to refurbish our library, I installed my first garden on a bookshelf behind the couch. It has been an easy-care thing of beauty which changes with the seasons and my inspirations, but over the years the mechanics have remained the same. The container, 6′ x 10″ x 5″, is made of rough cypress to fit the shelf. It is lined with plastic and filled with moss. The wall behind is faced with the same warm beige brick used on the outside of the house. This provides a rough texture to which creeping plants can adhere. For years creeping fig climbed happily up that wall to the lights. Two double-tube 48″ fixtures are hung by S hooks on the underside of the top shelf. These are hidden by a valance made of contact paper stapled along the edge of the upper shelf and covered with a rough braid. Valances can be made of any material as long as they hide the lights.

Some Plants to Know and Grow

What sort of plants should be used in the garden? What do you have? If you have some tired old kinds you are fond of, make tip cuttings to keep sentiment alive, and throw out the rest! Use whatever looks right for the garden. Don't be afraid to buy new plants. There are so many improved varieties of old favorites that you have a wide choice. Be aware of the light requirements for the plants. Fluorescent light is not sunshine so use only those plants which will survive in the indoor garden. In time the plants tend to grow together. You will have to pinch and prune to keep the garden under control, for plants, once established, usually flourish under this ideal setup. Some of the faster-growing plants may have to be replaced or they will swallow up the garden. Be sure you have healthy plants since in this close space disease can spread rapidly. Keep a sharp eye on the

Photos: L. Stephenson

This cupboard garden has four 24-inch tubes. A mirror behind gives the illusion of greater depth.

garden. You will be able to tell when things start to go wrong.

When you acquire a new plant, treat it as a house guest. Find out its needs and try to supply them. In time, most plants adjust, but if they don't, get rid of them! Also remember, nothing lives forever; remove tired plants and replace them with fresh. Like a new dress, a fresh plant does something for the scene.

Be on the lookout for variegated plants. Not only are they attractive, replacing bloom to some extent, they are also slower growing, which is a real plus for the small garden. Solid-colored foliage, which contrasts nicely with variegation, comes in all shades of green, also yellow, bronze, gray, blue and even near-black. Subtle shading adds to the garden.

There are many kinds of ferns which grow well in the damp moss and make a beautiful backdrop for blooming plants. They also cascade over the front of the container, softening the line. Small golden Boston fern, for example, is a terrific accent before it outgrows the light garden. Peperomias come in many shapes, sizes and colors. For the most part they grow best when a bit on the dry side, so go light on the watering. The rhizomatous begonias have stunning foliage with occasional dainty blossoms for a bonus. Grape-ivies, creeping fig, the spiderworts, plectranthus, all have spreading foliage and do well. Forget regular ivies (*Hedera helix*), which tend to attract red spider. I am partial to *Pedilanthus tithymaloides* with its upright zigzag stems and leaves of white, green and pink. It is a good background plant, as is *Cyperus alternifolius,* a short papyrus relative with starlike foliage. This plant makes a lovely airy cover for a piece of sculpture or a rock. (Speaking of rocks, place an upturned pot in the container and sit the rock on top of it.) Some of the shorter dracaenas have striking foliage. Work your colors in carefully. Almost any small plant will do, and if it gets too big, move it out. Just know what it likes; if it fits the garden formula, try it.

Other Plants

For longlasting flowers, the Gesneriad Family is hard to beat: African-violets, streptocarpus (the long strap leaves can be reshaped), columneas, nematanthus, episcias, sinningias and others. Kalanchoes in vivid colors are long bloomers. In winter, dwarf cyclamens add an airy touch; forced bulbs bring in a bit of fragrance. For a cool summer scene, I use white bedding begonias against a green and variegated background with a white owl presiding over it all. The dead blooms need constant attention, but the overall effect is worth the effort. Sometimes I tuck in a vase of fresh flowers such as a spray of moth orchids or some other long-lasting flower.

So . . . set the stage with the foliage plants—the tall ones to the back, then the medium-sized ones with the creeping ones in the front. (Place the ones that may bloom under the brightest light.) Using restraint, add the sculpture, rocks or bits of driftwood for accent and to create the illusion of out of doors. Don't coddle the garden—let it grow. If you think it looks lovely in the daytime, just wait until night. It sparkles like a jewel!

Gardening is therapy for many of us. I have a friend who has multiple sclerosis and is confined to a wheel chair with only the use of her left hand. But with her initiation to the possibilities of gardening under lights, she has started a whole new career. She is blessed with a husband who can create in his workshop anything she needs to make her an independent gardener. He devised a gravity watering system with the tank hidden above the garden and a watering wand which she can control. People come from all over to meet her and see the fantastic gardens that she has created. And her gardens keep changing all the time, for these are living pictures made up of repetition and variation of plant material. Blooming plants contrast with textured ones. A touch of white almost sings under lights and intensifies everything around it. The patterns in the gardens change as bud becomes a flower and then a seedpod, or a fern frond unfurls. Every day there is some new excitement! So, get started. Create a garden which you can maintain with ease but which satisfies your soul. It will be a peaceful oasis in a hectic world. ❧

To save time and have better plants, try . . .

GROWING ON MATS

Phyllis Rosenbluth

I grow about five hundred plants in a four-and-a-half-room apartment. To give them proper care, I must rise before daylight to carry out my chores before leaving for a full-time job. When I first heard about capillary matting and realized that it might be a time-saving and effective plant watering system, I was impelled to give it a test.

Simply stated, the "mat watering" system involves placing plants in pots (with drainage holes) on an unwoven, synthetic material that is kept evenly moist. The weight of the pot and its contents make contact with the damp mat and results in moisture being drawn up into the pot as the plant needs it. Thus, instead of watering *each* pot, only the mat is watered. I have a number of trays lined with matting. Each tray holds from seven to thirty plants depending upon the size of the pots. In the early morning I walk through the apartment and—boom! boom! boom!—I am finished in one-quarter of the time the watering chores used to take!

In addition to saving time, there is another important advantage: Capillary mats enable you to greatly increase the humidity. Many plants which we enjoy growing demand such high humidity that, before the advent of the mat system, it was possible to raise them successfully only in a terrarium bowl. Now, such plants as *Sinningia pusilla, Episcia* 'Cleopatra' and *Begonia* 'Rajah' thrive in the open room.

Which Plants to Try

I group my plants according to their needs for moisture. On the "wet" mats (those

J. Golding

Plastic-lined tray holds the matting material in this gesneriad garden. Mats cut down on watering time.

kept uniformly moist at all times) the following are placed: *Gesneria* species, Singapore-holly (*Malpighia coccigera*), dwarf pomegranate (*Punica granatum* 'Nana'), *Passiflora trifasciata* and *Sonerila margaritacea*. The suckering of miniature African-violets (*Saintpaulia*) is reduced when they are grown this way.

The "dry" mats (those which should lose almost all their moisture before rewatering) enable the following plants to thrive: episcia, kohleria, sinningia, crossandra and ficus. One of the jewel orchids *Haemaria* (*Ludisia*) *discolor* performs nicely for me when grown this way.

In my experience, plants which do not grow well on mats include rex begonias, columneas, nematanthus and davallia ferns. These are plants which thrive in the home when they are allowed to dry out completely before rewatering.

Increasing Plants

Capillary matting makes propagation of a plant easy. Place a stolon or tip cutting in a porous potting mix in a 2½" pot. Water from the top to start the capillary action and place a plastic sandwich bag over the pot. Seal with a rubber band or Scotch tape. To allow the pot to make proper contact with the mat, the bottom of the pot is not covered by the bag. A few weeks later, the top of the bag is opened, allowing the plant to adjust to the outside humidity. The remainder of the bag may safely be removed a few weeks later.

The capillary action system has also increased the successful reproduction of woodier, "harder-to-root" plants such as jasmine and hibiscus. Instead of a single tip cutting, I place multiple cuttings of these plants in 3" pots. The same procedure as given above is followed with the exception that these cuttings require approximately two additional weeks in the plastic bag. Each cutting is then separated out and put into an individual pot. The rate of success with this method is about 90 percent.

Culture and Materials

Capillary mat growing requires a loose, porous soil mix which can provide many air spaces. It is most important to avoid heavy soils that contain clay particles. These have fewer air spaces and less vital oxygen, thereby contributing to root rot. My favorite mix consists of one part Pro-Mix, one part Hyper-Humus, and one and one-half parts super-coarse perlite. Another successful formula consists of one part vermiculite, one part perlite and two parts sphagnum peat. You may have your own favorite. It will work if it is porous.

My pots range from thumb size to six inches. Plastic pots prove most effective because their thin bottoms make better contact with the mat. When growing on mats, do not put crocks in the bottom of any pot. If you use a clay pot or a bonsai dish, place a piece of sphagnum moss in the drain hole to aid the water intake.

A wide variety of synthetic material is available for use as matting. This can range from improvising with scraps of blankets, carpeting or fake fur to several commercial products. I prefer Vattex P, which is heavier and thicker and tends to hold water for longer periods of time. In apartment growing, the algae builds up about every two months. Vattex P cleans easily if soaked in soapy water with a little bleach for half an hour then thoroughly rinsed.* When you cut the matting to size, allow for about 10 percent shrinkage after cleaning.

Matting can be set up in several ways: placed directly in waterproof trays, spread over a plastic egg crate in the tray allowing one edge of the mat to touch the waterfilled tray, or extending the matting to a reservoir at the end of the shelf.

When placing the pot on the moistened mat for the first time, you must water from the top of each pot to start the capillary action. Ordinarily this need not be repeated on a routine basis. However, when a tray contains plants of varying sizes, the capillary action may break down occasionally because the bigger pot or thirstier plant will absorb most of the water. In this case, the action must be started once more by watering from the top.

I add one-quarter-strength fertilizer to the water every fourth time a mat is watered. When I remove plants from the

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*Mrs. C. S. Hawley in *African Violet Magazine* notes that to prevent algae on a capillary mat, lay copper pennies on it—one per square foot.—*The Avant Gardener*, Vol. 12, no. 12.

Sphagnum moss in the drain hole of the pot aids in the water uptake in clay pots or bonsai dishes.

Photos: J. Golding

Plastic "egg crate," actually a diffusion panel from a fluorescent light, elevates matting and pots, permitting a larger water reserve.

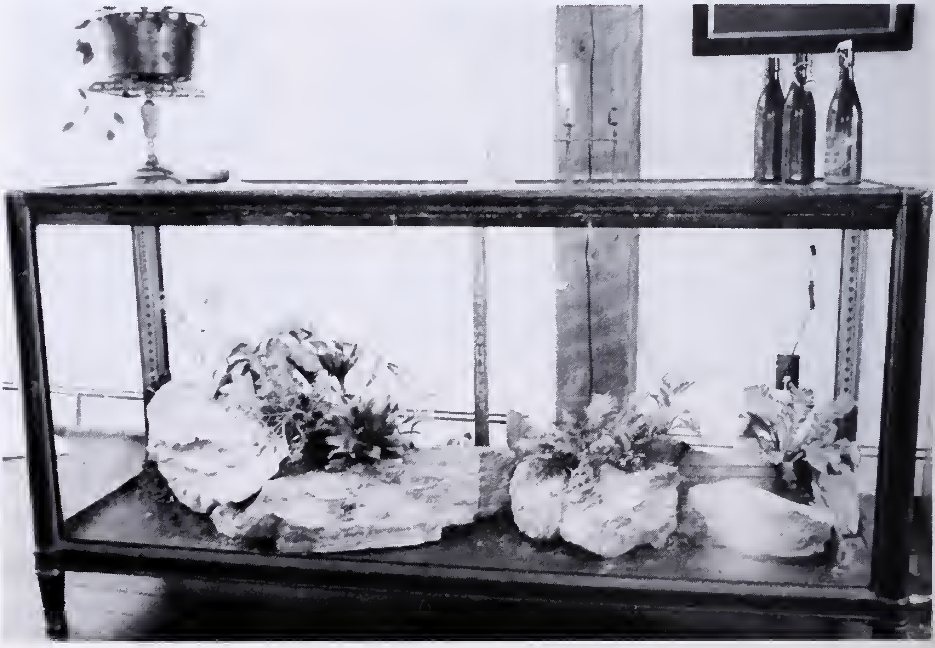
trays to clean the mats, I find that this is a convenient time to add a small amount of fish emulsion on top of the soil in each pot.

A word of caution. Don't let the time-saving element blind you to the individual needs of your plants. Tender loving care (TLC) is repaid with beautiful, sturdy, thriving plants. To assure your satisfaction and enjoyment in growing, take the time to pick up the plants on a regular basis to check for signs of disease or need for grooming. A combination of your personal touch and the capillary matting system can provide the atmosphere for successful growing with greater ease. ❧

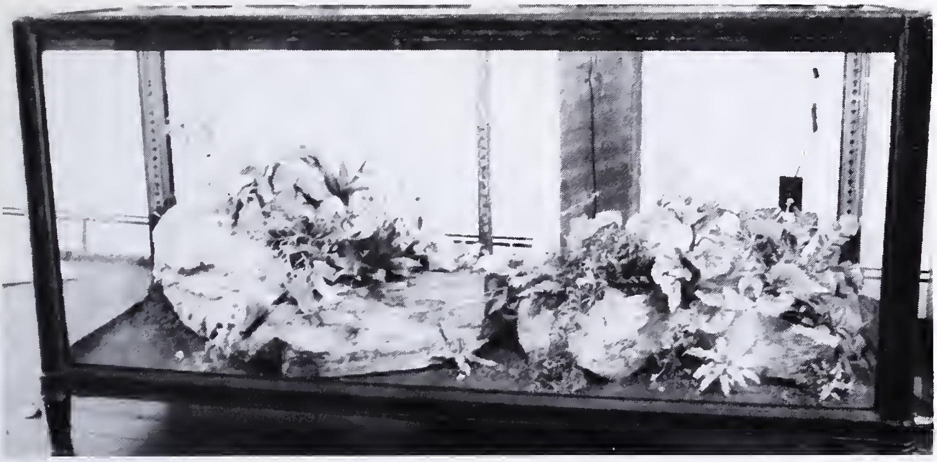
SELECTED PLANTS FOR TERRARIUMS UNDER LIGHTS

Neale Wendy Stuart

Above, careful and aesthetic placement of the stones give form to a terrarium in an antique display case. Below, larger plants are positioned first to enhance the rock structure.



Photos: Todd Stuart



Smaller plants and moss finish this terrarium under lights.

PLANT	LEAF COLOR, TEXTURE	GROWTH HABIT
Begonia *bowerae* var. *nigramarga*	mottled brown/green	hairy ROS, M
Begonia prismatocarpa	light green; FL orange	ROS, M
Begonia pustulata	silver green, ridged, beautiful	ROS
Chamaedorea elegans, parlor palm	deeply cut, shining green	T; Use when small
Fittonia verschaffeltii, mosaic plant	green with pink veins	CR
Fittonia verschaffeltii, var. *argyroneura*	green with white veins	CR
Gesneria cuneifolia	dark green, shining	ROS, M
Hedera helix, English ivy	choose only small-leaved kinds; green/white	V
Pilea cadierei, aluminum plant	silver/green	T
Pilea involucrata, friendship plant	light green, ridged	T
Polystichum tsus-simense and other diminutive ferns	lacy, green, great	M
Selaginella pallescens (emmeliana), moss-fern, also try *S. braunii* (tuft-forming), *S. kraussiana* (spreading) and *S. uncinata* (spreading blue)	lacy	ROS
Sinningia concinna Other miniatures include *S.* 'Dollbaby' (hairy green, FL purple), *S. pusilla* (green, FL purple), *S.* 'White Sprite' (green, FL white)	green; FL white/purple	ROS, M ''
Soleirolia soleirolii, baby's-tears or helxine	tiny-leaved, good scale	CR

KEY:

CR=Creeper; FL=Flower; M=Miniature; ROS=Rosette shape; T=Tree shape; V=Vine

If your interest is in terrariums, consult BBG Handbook #78, *Terrariums,* guest edited by Brenda Weisman. See back cover of this Handbook for ordering information.—Ed.

Photos: E. Clawson

Miniature geranium 'Janet Kerrigan'

What every grower should know about . . .

MINIATURE GERANIUMS UNDER LIGHTS

Evelyn Clawson

For the indoor grower, miniature forms of standard garden plants have always been a particular blessing—how else could a sizeable collection be accommodated? With the advent of easy and highly successful light gardening, miniature geraniums (actually members of the *Pelargonium* genus) have provided reciprocal benefits since their size is perfectly adapted to the dimension of the average light-garden shelf. Flowers are large and showy in relation to the small plants, and under fluorescent tubes the flowering season of geraniums has been stretched to cover the entire year. To encourage miniature geraniums to put on a continuous display under lights, however, a few cultural dos and don'ts should be heeded.

Light

Four 4′ fluorescent tubes, or the center position under two 8′ tubes (all with reflectors) should be considered minimum illumination for nearly all geraniums. Plants will survive with less but will not bloom, and growth will be unpleasantly etiolated. If back wall and shelf area are painted flat white for maximum reflectivity, so much the better. Fluorescent light can consist of 50 percent cool white and 50 percent warm white tubes, inserted into fixtures alternately, or some of the newer wide-spectrum tubes may be used with good results. The tops of the plants should be one to six inches below the tubes, allowing clearance for flower heads. Once buds are initiated, it is possible to rotate plants away from the brightest positions in order to let others take their place.

Lights should be left on fourteen to eighteen hours, controlled most dependably by a timer. However, if lights are run at least fourteen hours, additional illumination does not necessarily guarantee better blooming. Other cultural considerations take precedence at that point.

Temperature and Ventilation

Although we are apt to associate geraniums with long, hot summer days, they much prefer being grown cool—a preference that can hardly be stressed strongly enough for the light gardener. Unless daytime temperature can be held to about 70°F, with a nighttime drop to 55° to 60°, success with mini-geraniums will be marginal. Use of consistent air-conditioning during hot summer periods, or location of the light garden in a cool, well-insulated basement, is of great help. Temperatures can also be lowered 10° in summer by running the lights during the nighttime hours, reversing the diurnal cycle, if the unit is located in a windowless area. Relocation of the fluorescent ballasts away from the growing area also reduces heat.

Geraniums also abhor stagnant air, a condition frequently present in partly enclosed light shelves. Plants should be

A four-tube light unit gives plenty of light for good geranium bloom.

spaced to allow for air circulation, and a fan would be found highly beneficial. This can be either a large fan rotating at slow speed some distance away, or a whisper fan (boxer fan) positioned at one end of the light shelf. These little fans (6″ x 6″ x 1½″) are quiet and run for years without maintenance, drawing 14 watts.

Culture

To create an optimum environment for geraniums, their partially succulent character should be borne in mind. Relative humidity of 30 percent to 50 percent will suit them beautifully. The semi-arid conditions of their native habitat in southern Africa endowed them with firm stems able to store moisture for time of future need. In cultivation this mandates a well-drained potting medium containing some coarse builder's sand and fine gravel. (For mixing small quantities, parakeet gravel from pet stores or traction grit from hardware stores comes in handy.) These, together with some peat moss and a little perlite and vermiculite, should be added to sterilized topsoil or sterile commercial potting soil containing less humus than that used to grow tropical plants. Enough ground dolomitic limestone should be added for a mix of near neutral to very slightly acid pH, together with some all-purpose fertilizer and a small amount of superphosphate (or some slow-release Mag Amp). A little gravel should always be put in the bottom of pots for drainage.

A satisfactory soil mix used to maintain a miniature geranium in a 2½″ or 3″ plastic pot should require watering every second or third day—a more reliable test than any other. A mix remaining damp for a longer period will prove too heavy, inviting root rot; it should be lightened with additional sand, gravel or perlite. On the other hand, a mix that dries too quickly, or insufficient attention to watering, will cause geraniums to harden prematurely, presenting an unattractive woody, aged look.

A constant-feed program of fertilizing should be practiced, using a dilution of ⅛ to ¼ tablespoon per gallon, and watering with plain water every fourth or fifth time. Rotating different fertilizer formuli insures balanced nutrition; under lights miniature geraniums grow vigorously all year, so feeding should not cease in fall.

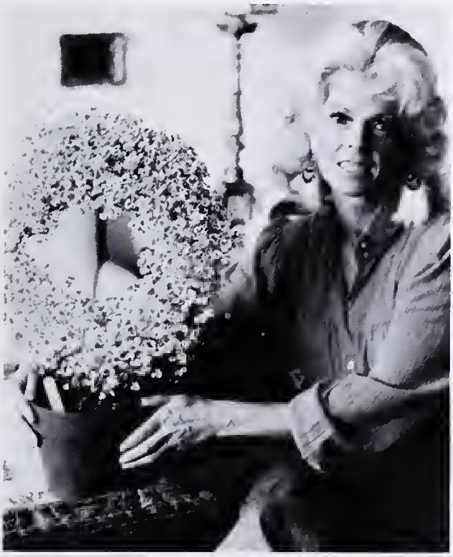
Size and Pruning

These less-than-standard-size geraniums are divided into dwarfs and miniatures, but the border between them is not rigidly fixed. Ultimate size is, in most cases, determined by the size of pot in which a particular specimen is grown. Rooted cuttings should be restricted to 2″ pots and, ideally, plants should be maintained in 2½″ pots during their prime first year. Very mature minis may then be moved to a final 3″ pot, but increase in plant size nearly always results. When a miniature geranium has outgrown a 2½-to-3″ pot, usually toward the end of its second year, start a new plant from a cutting. Such a young plant will be a more prolific bloomer than a plant past its prime.

Growing the plants in this relatively small volume of soil eventually results in depletion of nutrients and a breakdown of soil texture. A root-pruning twice a year, with some new soil replaced in the same size pot, is a sound cultural practice. But even with the best of care, it is the nature of geraniums to gradually lose their bottom leaves as new growth takes place at the tips of branches. If unchecked, this habit results in gawky, bare stems sporting only "feather-mops" of leaves at the growing tips. Plants should be pruned regularly, before reaching such an extreme stage.

A mini-geranium can be cut back to within 1½-to-2″ of the soil line and (with watering carefully reduced) sprout again in due course. But with no leaves remaining to carry on photosynthesis, regrowth can be very slow. Response after pruning is quicker and safer if the plant is left with at least part of a branch and a few lower leaves. Once new growth is securely on the way the old remaining branch can be trimmed off. As flowers are produced only on new, green wood, the advisability of such occasional cutting-back will be readily seen. But drastic top and root pruning at the same time are best avoided—such stress may prove too much. Single-stem rooted cuttings should be pinched to bush; later, the number of

Geranium 'Orange Imp' a good candidate for the brighter light garden.



Lemon-scented variegated 'Prince Rupert' trained as topiary by the author.

branches should be restricted to four or five in order to bear bloom. Additional branches compete for the plant's strength and inhibit flowering.

Propagation

Two-to-3″ sturdy (not etiolated) cuttings of mini-geraniums root with the greatest of ease. Make a clean cut one half the width of the stem below a leaf node, then remove all but the top three leaves and all stipules which will be below the soil line. Next allow the cutting to callus for 12 to 24 hours. For rooting, a 2″-to-3″-deep container with drainage holes should first receive ½″ of perlite, then a slightly moistened mix of two parts peat moss, one part sand and one part coarse perlite. Insert cuttings firmly, water and position 2″ to 4″ under the fluorescent tubes; thereafter water sparingly as needed. Rooting will often be one hundred percent.

In naming the best miniatures to grow under lights, top honors must go to geranium 'Alpha' (red and pink forms), the one low-light exception, producing its single blooms continuously under just two tubes and at higher temperatures. Under such conditions growth will be less compact, with longer internodes resembling a miniature hanging-basket plant. Given high light, 'Alpha' assumes fine form.

For the brighter light garden, try the following proven performers, all miniatures remaining at 6″ to 8″, and usually available: 'Orange Imp'; 'Salmon Comet' (single); 'Small Fortune' (pink and white double); 'Goblin' (dark red double, dark foliage); and 'Cameo' (deep pink, white centers, double). But this is only a short list; many other varieties will make worthy additions to a collection.

Photos: Charles Marden Fitch

Micro miniature 'Littlest Angel'

Why not enjoy America's number one flower through the seasons . . .

MINIATURE ROSES UNDER FLUORESCENT LIGHTS

Charles Marden Fitch

You can have fragrant roses all year around by growing miniatures under fluorescent lights. For gardeners in cold temperate climates it is especially thrilling to pick roses during the winter. Rose experts also like to grow miniatures under lights so they can have top quality blooms for rose shows. I like growing miniatures under lights because the tiny flowers are so abundant, colorful, often fragrant and last many days when cut in bud. Best of all, the miniature rose bushes are cold hardy so after enjoying them under lights a season or two, one can plant them in the garden for years of outdoor pleasure. This makes space for new kinds the next winter.

Light and Temperature

Like the larger roses, miniatures must have intense light to produce the best blooms. With low light they will grow but flowers will be few, colors abnormal, stems weak. My best indoor miniature roses are grown under four 40-watt broad spectrum fluorescent lamps. The bushes under broad spectrum tubes have more flowers, better color and sturdier stems than the same varieties grown under plain household lamps such as cool white or warm white.

Miniature roses produce buds on new growth, so keeping them growing is important. I provide 14 to 16 hours of light per 24-hour period. Seedlings will bloom faster if given up to 18 hours of light. Keep foliage close to the lamps but watch that buds do not touch the tubes. Although fluorescents are cool compared to incandescent bulbs, they will still burn leaves or buds that push against them.

My miniatures thrive under intermediate conditions, with night hours 58 to 62°F, daytime highs up to 78°F. If grown cooler, they slow down and flowers last longer; if grown warmer, they tend to have lighter-colored flowers which last fewer days. Since these are cold-hardy plants they can accept very chilly temperatures, but the object of having them indoors is to get flowers on new growth. Therefore nights of 60 to 65°F, combined with bright 14 to 16 hour days, are the most practical. Keep relative humidity between 50 and 60 percent. Low humidity encourages red spider mites and smaller flowers; too high a humidity, especially with still air, encourages fungus.

Potting

The smallest miniature roses thrive in 3″ to 4″ pots. Taller ones grow well in 6″ to 10″ containers. Slightly restrict root room if you wish to keep bushes compact. Plastic pots are excellent, but clay are also suitable if you avoid letting the bushes dry out completely at the roots. Place ½″ to 1″ of gravel in the bottom of the pot, then add a chunk or two of hardwood charcoal, followed by coarse unmilled

Miniature rose ready to be potted. On hand are gravel and charcoal for drainage, sphagnum and potting medium.

Left, miniature rose 'Over the Rainbow' has velvety red petals with striking yellow reverse. The flowers are fragrant and long-lasting. Below, 'Orange Fire' is a compact shrub. The flowers are red-orange.

Lyndon Lyon's basement where the well-known hybridizer grows hundreds of miniature rose crosses under fluorescent lights.

sphagnum moss, then the potting mixture.

I find commercially prepared potting mixes suitable when the package directions are followed. Some types contain fertilizers, others grow nice plants only when fertilizer is provided in solution every few days. The mix should be slightly acid and retain moisture without getting soggy. Miniature roses should never dry out completely at the roots.

Ordering, Selections

Mail-order miniature rose specialists will send you sturdy bushes anytime. For indoor growing start with dormant bushes as sent by many nurseries, or pot active bushes, but let them stay outdoors in the fall to early winter until they experience 6 to 8 weeks of cold weather. As cold-hardy plants, miniature roses should have a dormant period each year to make the best growth and keep a compact shape.

Most suitable for growing under lights are micro miniature hybrids and selections that can be pruned to stay under 8″ tall. With the recent great interest in miniature roses many hybrids have been developed, and each year a batch of new ones is introduced. Some of my favorite proven selections are: 'Cinderella', a compact, very double white blushed pink; 'Littlest Angel', a micro mini with wider than high habit, perfectly formed golden yellow ½-inch flowers on a 3″ to 4″-tall plant; 'Magic Carrousel', a sturdy fragrant white with red edges, excellent form, long lasting; 'Party Girl', a fragrant apricot yellow of exhibition form, adaptable habit; 'Pacesetter', a perfect miniature of classic hybrid tea type, white sometimes blushed pink, fragrant; 'Rise 'n' Shine', the best yellow mini for fragrance, form, color; and 'Zinger', with brilliant crimson red flowers which show a contrasting yellow center when mature.

Culture

Miniature roses will produce the first flowers six to eight weeks after starting growth after a dormant period. Once active they continue to produce flowers for many months. Provide a balanced fertilizer in solution every other watering or apply timed release fertilizers designed for roses. Active roses need a steady supply of nutrients and water. You can prune back bushes to keep them compact but always leave at least one third of the growth.

Miniature roses indoors are less likely to get foliage fungus if you keep air circulation constant. I use a fan going all the time in my basement light garden area and also in the greenhouse. Wash bushes with room-temperature water every month to discourage red spider mites. Miniatures can be treated with the same fungicides and pesticides used on outdoor roses. ❧

America's most popular house plant . . .

AFRICAN-VIOLETS— IDEAL FOR LIGHT GARDENS

Laura S. Progebin

Fluorescent light gardening has made the growing of African-violets (*Saintpaulia*) simpler and opened a world of beauty for even the novice grower. The main requirements for growing beautiful plants are good, even light, correct application of fertilizers, a substantial yet porous growing medium, and humidity. The combination of these factors is what produces a prime African-violet. Add cleanliness and good cultural practices and you are on your way to productive growing.

Regardless of fixture size, you may use the combination of a cool white and warm white tube, Gro Lux, Gro Lux Wide Spectrum, Duro Naturescent or any of the light tubes now available. My preference is for Gro Lux because I think it produces darker, handsomer foliage. The tops of plants are kept from ten to fourteen inches from the tubes; miniatures and semi-miniatures are grown no more than six to eight inches from the tubes. Saintpaulia species and hybrids with light-colored blossoms are grown at the ends of the fixtures, as they require less light. Darker-flowered plants do best at the center range, where the light is strongest. If you do not own a light meter, you can gauge the strength of the light source by placing a sheet of white paper on top of your plant(s). Place your hand midway between the light and paper. If you have a well-defined shadow, the light is adequate.

For a custom-blended medium I use two parts good-quality African-violet potting mix, one part perlite, ½ part vermiculite, one part humus, 1 tablespoon each of ground dolomitic limestone and of superphosphate, ¼ part horticultural charcoal and one teaspoon of TEM (trace elements). The mixture is thoroughly blended and moistened, then stored in polyethylene bags or containers. Do not store potting mixes in metal containers because this will alter the pH of the medium. All gesneriads including saintpaulias need a neutral pH.

Fertilizing and Watering

In their native environments plants have rainwater, various minerals and microorganisms in the soil to nourish them. When plants are grown indoors nutrients are missing unless you replenish them by fertilizing. My preference is for the program known as "constant feed"—the application of a dilute solution every time the plant is watered. Fertilizing at full strength is risky for anyone but an expert. A plant which has been allowed to dry can be badly burned by a full-strength solution. Use of quarter- or half-strength solutions every watering minimizes this risk.

The single greatest cause of problems is the tendency to over-water. The new grower should start by touching the surface of the growing medium. If it feels moist and particles cling to a finger, there is enough moisture present; wait another day. Keep in mind that the rootball retains more moisture than the surface and that plastic containers hold moisture longer than clay pots, which are porous and dry easily. Before being used, the latter should be soaked until they stop "singing." All containers should have drainage holes. Use tepid water when watering or fertilizing, never hot or cold.

Fertilizers recommended for use in rotation for African-violets are Peters 12-36-14 (5-50-17 for variegated foliage), Rapid-Gro 23-19-17, Peters Special or Hyponex 20-20-20, used in that order in the dilute solution. For variegated foliage I dilute the Rapid-Gro to no more than ¼ strength to maintain strong variegation. The fourth watering in the rotation is with plain tepid water. This is done after loosening any salts or minerals which

L. Progebin

A very young *Saintpaulia grandiflora,* four months from a cut leaf, grown in a lucite box with the lid partially removed.

may have accumulated on the surface as a "rusty" discoloration.

Capillary mat systems are probably the easiest way for a new grower to learn about maintenance of an African-violet. (For information on mats, see page 11.) There are also commercially produced wick-watering containers with and without reservoirs. Another method of providing humidity is to set plants on trays of moist turkey grit, kitty litter or gravel. Still another way is to mist the plants daily. Under fluorescent lights misting is not harmful to foliage. Fill the sprayer with hot water. When hot water travels the distance of eight times the diameter of the sprayer's opening, it becomes room temperature. Use of cold or tepid water in misting damages foliage. Misting should be done soon after lights go on so foliage dries before dark. Foliar feeding may be implemented with the mister and is convenient for regular fertilizing. Use only fertilizers recommended for foliar feeding; an excellent one is Schultz Instant 10-15-10 liquid.

As a rule, African-violets should be potted in containers up to one-third the size of the diameter of the plant. They grow best when slightly potbound. Growing them in too large pots will likely result in too much moisture, causing plants to develop crown rot. When you pot do not press down on the medium. Instead tap the pot gently on the table as you fill in around the plant to settle the medium firmly around the roots. Maintain the crown just level with the top of the mix. When repotting to a larger container, move up to the next size larger. However, for mature plants of the "standard" and "supreme" varieties, you may want to skip the next size and move up to the second larger container. One of the simplest ways to repot a plant is to place a pot of equal size inside the next larger sized pot and then fill in the edges of the larger pot with soil. When you remove the smaller pot you will have a hollow the size of the rootball. Carefully remove the plant from the old container, soil and all. Set it into the hollow, fill in where necessary, and put some of the medium on the surface. Settle it as directed, then water.

Grooming and Cleansing

Good grooming is essential. Spent flowers should be removed with small, sharp scissors; never pull them off. Blossoms allowed to dry on foliage will stain it. When the peduncles (flower stems) dry, these too should be properly cut where they join the main stem. Usually, embryonic buds will appear under the original peduncle. If you pull the stems from the plant you will likely take along these future flower stalks. Turn plants occasionally to maintain symmetry. Except for those dead center under the lights there will be stronger lighting from one side. If the foliage is inclined to stretch upward, your plant is too far from the light source. If foliage turns downward, it is too close to the lights. Offsets, referred to as suckers, should be removed before they distort the plant. Deft fingers can do this by hooking the curve of a nutpick at the back of the offset, where it joins the main stem; otherwise, remove the offset with fine forceps as soon as it is discovered. This work should be done when the plant is in need of water; it is more pliable at this time.

Saintpaulias may be cleansed by rinsing them under a gentle stream of tepid water. First wrap the pot in an apron cut from a poly bag; bring it over the growing medium close to the crown and overlap the ends. This will keep the flow of water out of the medium. Work from the top of the crown outward, holding the plant at an angle to allow the water to run off the leaftips, and gradually work to the bottom layer of leaves. With a tissue or soft paper towel blot off excess moisture. An alternative is to cleanse the plant with a soft, new paintbrush. Follow the same principle of working from the top down. When using a brush, support each leaf as you stroke it; use light strokes from petiole to leaftip.

Propagation

Saintpaulias are readily propagated from leaves. Select a firm, healthy leaf. Cut it from the plant with a sharp, sterile blade; then cut across the petiole at an oblique angle leaving a stem of 1½ inches. Let the cut dry for twenty minutes to form a scab. Prepare a container filled halfway with your regular mix, then filled to the top with vermiculite. Moisten the contents, dibble a hole and set the leaf to half the stem's length. Firm the mix around the leaf. Support the leaf by placing a label stake with the varietal name at the back of the leaf. Occasionally a "mother" leaf will enlarge without producing plantlets. When this occurs cut off the top fourth of the leaf with a sharp blade. This will force the leaf to produce plantlets.

A Few Kinds

Miniature and semi-miniature African-violets require extremely high humidity. They are best maintained in protective environments, such as a lucite sweater box or a terrarium. Grow them no more than six to eight inches from the lights.

Trailers range from miniature to standard, with flower sizes to match. They make beautiful cascading plants for hanging baskets. When a trailer shows a reluctance to produce the trailing crowns, simply pinch out the tip leaf growth to encourage the trailing habit.

Colors and shapes of flowers run the gamut, but yellow continues to be conspicuous by its absence; it is a genetic problem. African-violets are not difficult to grow if you provide the basic requirements of culture. Among my current favorites are the miniature trailers 'Pixie Blue' and the variegated 'Li'l Creeper' (from breeder Lyndon Lyon), the variegated 'Sparkling Wine' (E. Champion), 'Wintry Wine', 'Wildfire' (Granger) and 'Coral Radiance' (L. Lyon). Among older varieties I am still partial to 'Nancy Reagan', 'Butterfly White' and 'Zorro'.

There is an organization new growers should know about—the American Gloxinia and Gesneriad Society—which issues a most informative and readable publication, *The Gloxinian,* six times a year. See page 64 for details. ⁂

Photos: H. Plever

Nidularium innocentii var. *lineatum*

Colorful relatives of the pineapple from South and Central America . . .

GROWING BROMELIADS UNDER LIGHTS

Herb Plever

A light unit for bromeliads has been in my living room for fifteen years. Six fluorescent tubes are mounted under the bar cabinet and three tubes under the shelf behind the simulated "tree" I made for epiphytic kinds. The far end of the planter and the tree receive supplementary daylight from the terrace door. The plants on the tree have been lit by various flood lamps from the ceiling. These are barely adequate for growth but fine for display. The 8-foot planter is waterproofed with epoxy Glovit and filled with six inches of coarse builder's vermiculite covered with a decorative layer of styrofoam chips.

The ballasts of the fixtures are remote to avoid heat build-up which removes the humidity all bromeliads need. A small whisper fan is mounted on the narrow fixture to move air across the plants. Most bromeliads need strong light to attain their characteristic compactness, bright color and markings. For growing under lights it is well to stick to guzmanias, vrieseas, nidulariums, tillandsias and cryptanthus, which grow well under moderate to strong light. Alternate warm white and cool white fluorescents provide adequate light for these genera. The lights are kept on for fourteen hours a day except for mid-December through February when the on-time is reduced to thirteen hours.

Tillandsias

About one hundred small tillandsias are mounted as epiphytes on the cork logs and plaques against the back wall and on

The author's light unit featuring his "tree" for the display of tillandsias and other bromeliads.

the tree. Heavy misting once or twice a week suffices to grow and flower them. My cold-water humidifier keeps relative humidity between 50 and 60 percent. A few drops of liquid fertilizer are added to my hand sprayer. Mounting the very tiny tillandsias can be accomplished by pushing straight pins into the cork on each side of the base of the plant and then bending them across the base. For other tillandsias a hole is punched or drilled in the cork along each side of the stem and a plastic tie inserted in the holes to fasten the plant to the cork. My clumps of *Tillandsia ionantha* turn bright red every year when they put up their long, purple flowers. Among the several hundred small, rugged tillandsias which do well under lights are the purple- or blue-flowering *T. aeranthos, T. baileyi, T. butzii, T. caput-medusae* and *T. circinnata;* fragrant flowering *T. myosura, T. crocata, T. streptocarpa, T. narthecioides* and *T. triglochinoides;* and the beautiful, fuzzy-leaved *T. tectorum.* With proper humidity and consistent spraying, these tillandsias will dig their tough roots into the hard, dry cork medium. If it is difficult to maintain good humidity in the home, you may need to give these plants a biweekly five-minute soak in the sink or bathtub by floating the cork upside down in the water, to which a few droppersful of liquid fertilizer can be added.

The rest of the bromeliads should be potted in a highly porous mix of fibrous peat moss, perlite, bark chips and shredded tree fern. They can all be watered once a week (ten days to two weeks if you keep your house cold in the winter) by wetting the pot medium and filling the center cups to almost overflowing. Monthly fertilizing should be at 30 to 40 percent strength using any standard water-soluble fertilizer.

Guzmanias and Vrieseas

Guzmanias and vrieseas do extremely well under lights, particularly the varieties and hybrids of *Guzmania lingulata.* I recommend *G. lingulata,* var. *minor, G. l.* var. splendens ('Peacockii'), *G.* 'Carine' and, best of all, *G.* 'Memoria'. These flower in ten to sixteen months from offsets and their orange- or red-bracted inflorescences stay in color for up to six months. *Guzmania musaica* has

Above, another shot of *Nidularium innocentii* var. *lineatum* showing the elegantly formed, striped foliage. Below, *Cryptanthus fosteranus* has striking rippled leaves.

lovely hieroglyph-marked leaves with purple undersides even before it sends up a spectacular inflorescence. *G. nicaraguensis* sends up a brilliant red-bracted, 6″-long cigar-shaped inflorescence with bright yellow flowers. It has a diameter of 10-12″ as do *G. lingulata* var. *minor* and *G.* 'Memoria', while the other guzmanias named spread about 1½′.

Vriesea splendens and its cultivars 'Nova' and 'Hera' are favored for their exotic, dark brown barred leaves as well as for their spectacular orange "flaming sword" inflorescence with yellow flowers. This plant grows very well under lights but, unless there is a lot of head room, you will have to remove it from the unit when it flowers, as the spike rises two feet. *V. splendens* also gracefully arches its leaves to a spread of two feet or more, so you will need lots of room for this beautiful plant. At the other end of the yardstick is *V. racinae,* a tiny three-inch gem with red-spotted leaves and inflorescence. Not much bigger is *V. carcinata* with its red lobster-claw inflorescence holding yellow flowers. *V.* x *mariae* is a larger (15″) apple-green hybrid with a broad, flat feather spike of red and yellow-green bracts from which emerge lemon flowers. Spreading to two feet, the *V.* x *poelmanii* selections send up equally tall, branched, candelabra-like inflorescences with brilliant red or red and yellow bracts. They make outstanding specimens. All of these vrieseas will stay in color for months.

Nidularium and Cryptanthus

Nidularium innocentii var. *lineatum* is one of the most beautiful bromeliads. Its light green foliage is heavily marked with white longitudinal stripes that serve as a good background for the dark-red bracted inflorescence with white flowers. This plant develops better markings under lights than it does in daylight. It spreads 15-18″ as does *N. regelioides,* whose apple-green leaves under good light will acquire a dark green mottling to set off the bright red inflorescence which is held low in the cup. The small-growing *N. burchellii* has leaves which are green on top and purple below. Its white-flowered head soon turns to long-lasting orange berries. Nidulariums like to stay wet with water in the cup. *N. innocentii* var. *lineatum,* in particular, can use additional water in mid-week.

Most of the cryptanthus (often called earth stars) color well under lights. Their shape is that of a many-leaved, flat starfish; they have no cups to hold water and are terrestrial in nature. They should be kept quite wet and can flourish even in the closed environment of a terrarium. You can safely add some potting soil to the medium for these plants. Cryptanthus do not have brilliant inflorescences; when flowering they send up short-lived, large white flowers with colorless bracts from the center leaves. They are grown for their unusual shapes, wavy, crinkly leaves and highly colored and barred markings. Most are quite small, ranging from four to eight inches in height, but some will spread a foot or more. The most spectacular *Cryptanthus* is a selection named 'It', which has longitudinal cream, green and rose-to-red stripes. It grows a foot or so in width and is a prolific producer of vegetative offsets. *C.* 'Pink Starlight' is like a miniature of the above plant but more symmetrical. *C. fosteranus* has the same shape and size as 'It'; this should be grown fairly close to the lights so its background color can be kept reddish-brown to set off the white, wavy cross-bars. Small-growing 'Ruby' assumes a lustrous ruby-red glow if situated close to the lights.

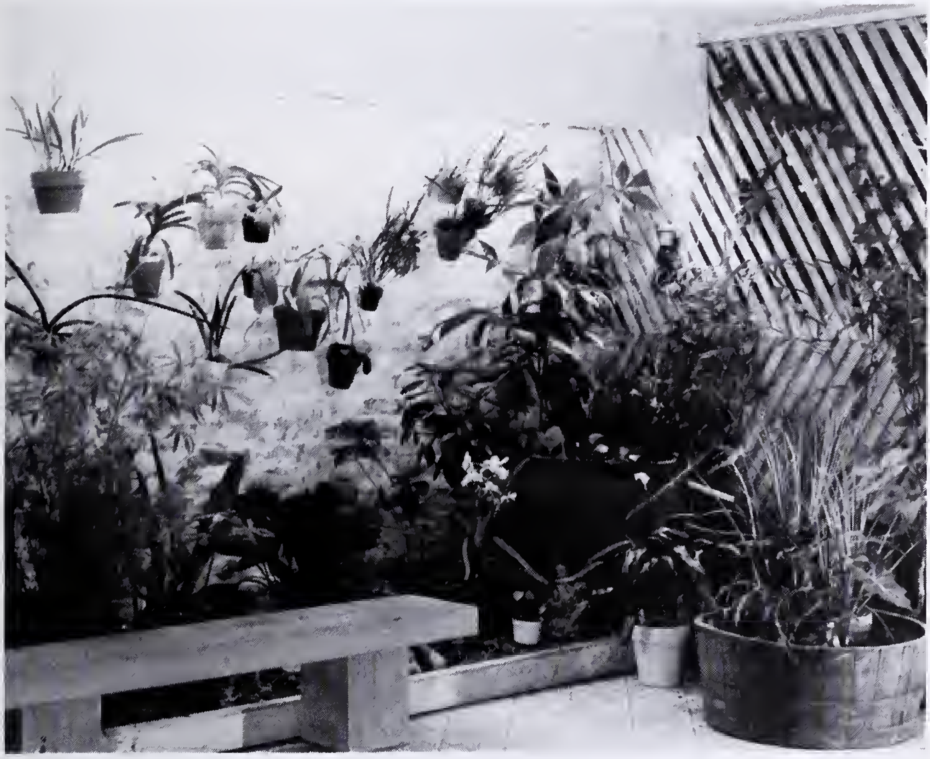
The distance from the plants to the tubes can be adjusted by placing pots, rocks or other platforms under the plants. This should be between three and fifteen inches for optimum growth, though plants will do better placed closer to the lower figure. The color of cryptanthus leaves can be adjusted by varying the distance to the lights. For instance, if the selection 'It' is too close to the lights the cream stripes will turn bright red and the green ones, black. In my opinion, this plant looks best with the cream, red and green colors showing, and the same holds true for 'Pink Starlight'. As the plants grow taller, the optimum distance to the tubes can be maintained by lowering the platform.

Light intensity is primarily a product of the number of tubes, their output and their distance from the plants. By increasing the number and/or output of the tubes and sharply reducing the distance to a few inches, you can even grow bromeliads that require high light, such as *Aechmea fasciata, Billbergia* 'Fantasia' and *Neoregelia carolinae 'Tricolor'.* Their leaves will likely be narrower and longer than when grown in sunlight, but if you have the space, these beautiful plants are worth the effort. ✤

INTERIOR PLANTSCAPES

Joe Cugno

Photographs by C. Awerdick



Garden in a Den

The family den is a place to relax, curl up with a good book and enjoy the company of friends. The patio in summer is a place to relax and entertain in a peaceful green environment. This is not always so easy to do, especially when you live in Greenwich Village, New York. With the help of horticultural designer Neale Wendy Stuart, Mrs. Debbie Peterson decided to move the outdoors into her family den. The outcome of their hard work and determination is not only breathtaking and exciting but truly a masterpiece of interior horticultural design.

The brick wall that serves as a backdrop was painted white. The main portion of this garden is lighted by eight 4′ tubes hidden behind a wood valance. The floor is protected by a wooden tray 8′ x 4′ lined with plastic. Black Mexican river rocks provide a bed for plants to rest on. Orchids hanging on the wall were summered outside and will bloom throughout their indoor season.

A unique feature of this garden is the aquatic plants growing in three whiskey barrels. The gently flowing water is home to acorus, water-lettuce and bamboo. This part of the garden is lighted by two Wonderlites. To complete the effect lathing strips are used to hide a window and provide support for various vines.

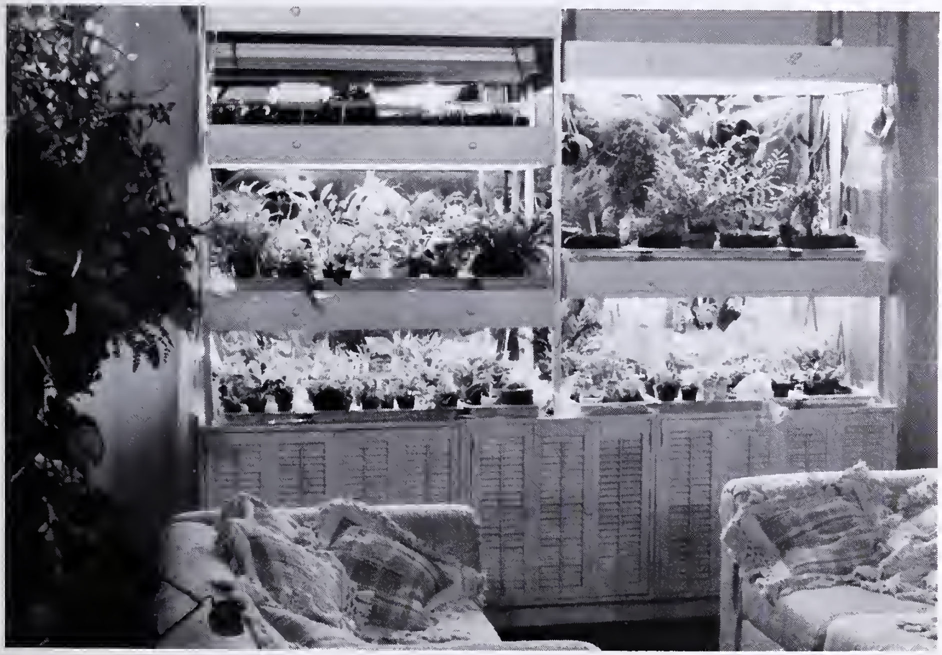
A Focal Point

This light garden is the focal point of the living room of Mrs. Lavia Berland. The design of this light garden is simple yet elegant. It is unobtrusive but eye catching.

The 1″ x 2″ standards are support for two shelves of growing space. The trapezoidal top serves as a housing for four 40-watt tubes. Another fixture is attached to the underside of the highest shelf, which is adjustable. (Note holes drilled into standard.) One more shelf could easily be added. Plastic egg crates are used to elevate the pots above excess water.

This light garden is not very large and takes up only four feet of wall space. It can be a beautiful addition to any room in the home.

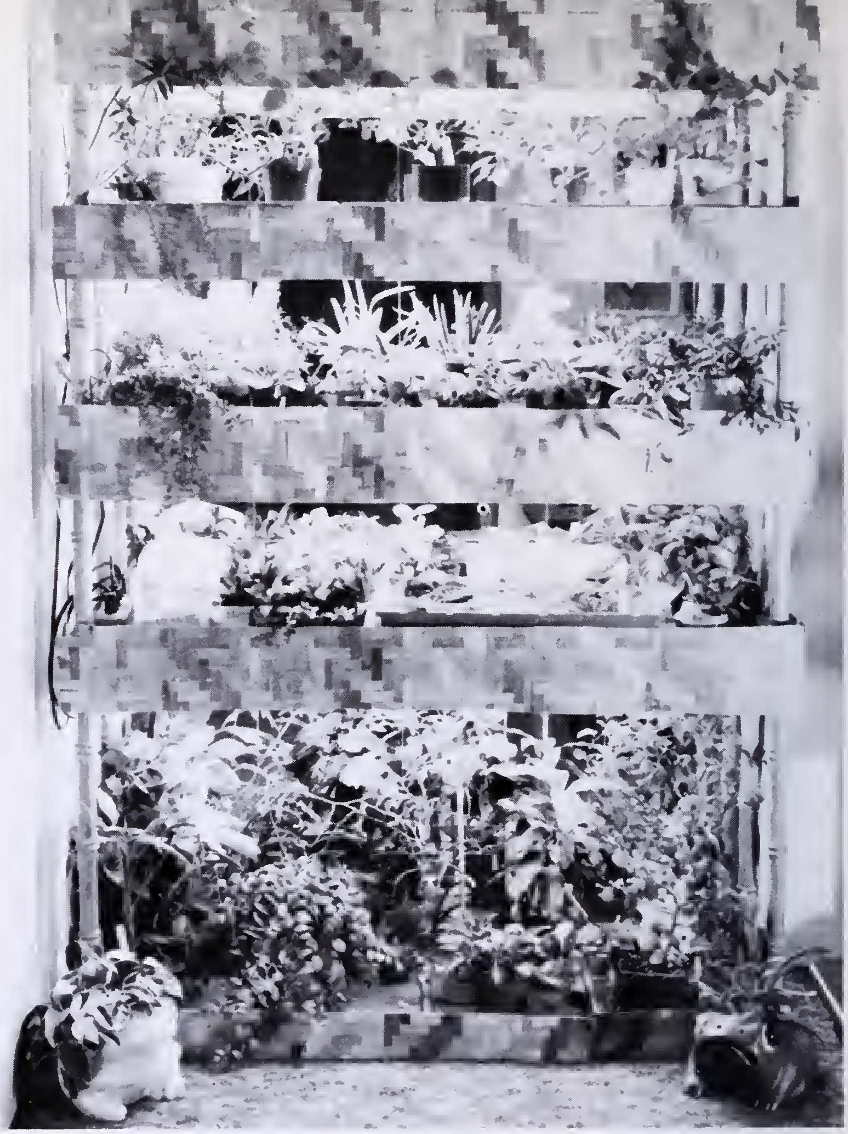
Plants Plus Storage



When you live in an apartment there is always the problem of storage space. When you live in an apartment and grow plants that problem becomes even more acute.

To help ease the situation this light garden incorporates 32 cubic feet of storage space into its design. All of the essential paraphernalia needed for gardening indoors is hidden from eye but is easily accessible. Shutters are used as doors to help create an outdoor effect.

The cabinets serve as a foundation for five separate growing areas. Each shelf is made of ¾″ plywood with a valance made to look like a drawer to hide the four foot four-tube fixtures. Mounting the shelves at different heights enables you to grow small as well as tall plants and can accommodate the arching spikes of this grower's orchids. To create the illusion of more greenery, 3 mil mylar is hung behind the unit to reflect the plants.



An Entryway Garden

In a very dramatic presentation, this light garden is the first thing you see when entering the Riverdale, New York, apartment of the owner, Mrs. Gail Egol. It is situated at the end of a long narrow hallway creating a memorable and striking effect.

The unit was built with materials available at any home improvement store. The sides consist of spindles that screw into each other. These spindles are made in various lengths and in a variety of motifs to go with any home decorating scheme. The shelves are masonite cut to 4′ x 16″ with holes drilled to accommodate the spindles. Four 4′ tube fixtures are fastened to the underside of the masonite. Trays for the plants are lined with capillary mats. To mask the trays and fixtures a valance of woven bamboo was added. To enhance the appearance and give depth mirror tiles were installed.

The ideas behind this most attractive light garden can easily be adapted to any living quarters. Styling and size are certainly flexible. You can start small and as your interest and collection grows add on more levels. ☘

Photos: Fran Finkbeiner

Adiantum trapeziforme with *Asplenium daucifolium*

Selecting and caring for . . .

FERNS

Fran Finkbeiner

Ferns, whose ancestors are familially traced to the Carboniferous Age some 250 million years ago, are completely compatible with twentieth-century artificial light. As a matter of course, the indoor light gardener who practices good, basic growing techniques can produce ferns to surpass those grown either on the windowsill or in the greenhouse—and to rival even some outdoor specimens. Most of the ferns grown indoors are tropical and semi-tropical; species requiring the natural dormant period of northern temperate zone plants may offer a tempting challenge to the collector, but really should be left outdoors.

Some ferns are less difficult to grow indoors than others but, like all house plants, none are carefree. An attractive container-grown fern is a reward for the attentive indoor gardener who *consistently* provides what the plant wants. In general the ferns we grow indoors are found naturally in shady, cool, moist areas on a jungle floor, clinging to bits of organic debris between rocks, or in crotches of trees surrounded by humidity-filled foliage where they receive intermittent sunlight and enjoy constantly-moving fresh air.

Fluorescent lights efficiently and inexpensively furnish the fern's light requirements with no damage to foliage from excess heat. The incandescent lamps with reflectors also produce the required light, but with distinct disadvantages. Heat generated by incandescent lamps, large and small, easily damages fragile fronds and emerging croziers (fiddleheads), making those lamps most suitable for mature specimens and groupings that may be maintained some distance from the light and heat source.

Epiphytic varieties and others with higher light requirements may be grown successfully a few inches from a two- or four-tube fluorescent fixture; terrestrial varieties accustomed to jungle floor and less light may be grown 8″ to 12″ or more away, or even on the floor beside a light garden. Ferns are content with a twelve to sixteen hour day, and may be maintained during your vacation periods with ten hours each day.

Treat Them Right

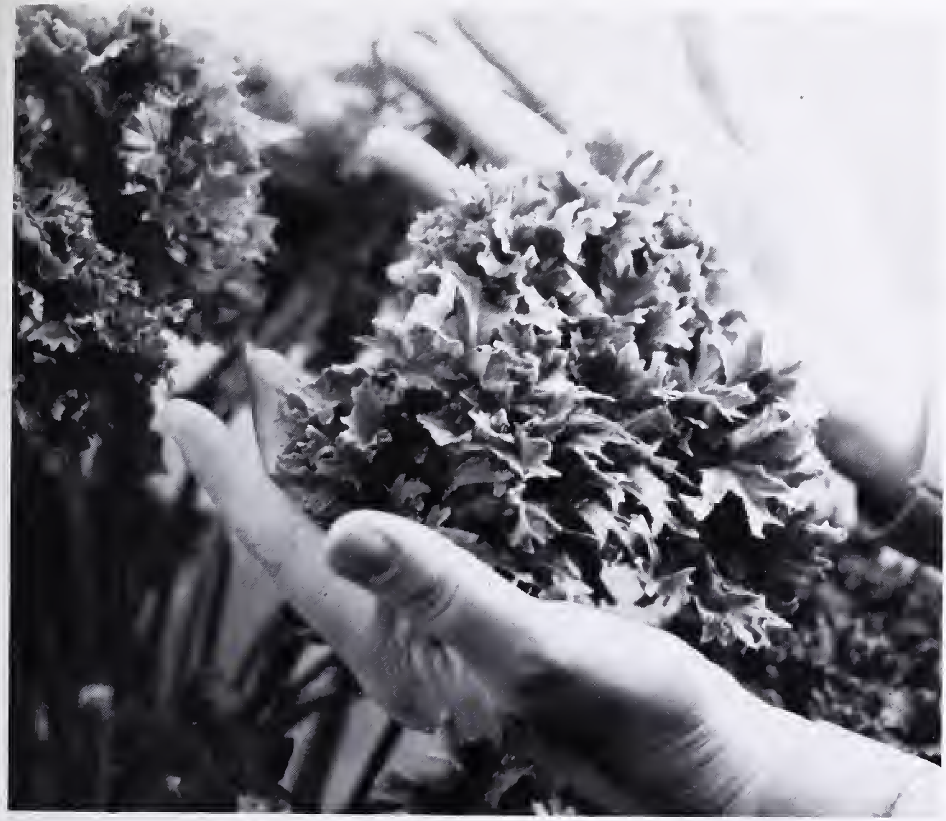
Given their origins, it should be no surprise that ferns generally require constant moisture around their roots, and that they thrive in high humidity. Water the plants from above with room-temperature water, taking care to moisten the entire soil ball, and then allow the pot to drain thoroughly. Do not allow the container to stand in water; do not overwater. Do not use water from a saline-softening system. A finger gently pushed into the soil should be damp, not wet. Grouping plants, placing them in moistened pebble- or vermiculite-filled trays, or placing an inexpensive drugstore vaporizer among or near the plants furnishes the humidity these plants find so necessary.

Capillary matting (see p. 11) offers a reliable method to maintain just-moist soil and ample humidity with a minimum of effort. The use of matting should be restricted to temperatures that encourage active foliage growth; that is, day temperatures from 70° to 80°F with a night-time drop no lower than 65°. Plants not in active growth utilize soil water slowly, and root rot from excess moisture eventually kills the plant.

A loose, quick-draining soil is vital to healthy fern growth. I use a mix composed of one part each of screened peat, coarse perlite, vermiculite and sterilized loam with the addition of one tablespoon of dolomitic limestone per four quarts of mix. The mix allows quick drainage of excess water, and at the same time retains the necessary moisture and provides aeration required for healthy roots.

Artificial light gardening blurs the natural seasonal changes and plants tend to grow year around, making a constant feeding system necessary. Ferns in active

In foreground are mature *Adiantum capillus-veneris* in ten-inch pots. Behind are *Polypodium aureum* 'Glaucum' and *Eucharis grandiflora*.



A heavily crested cultivar of *Phyllitis scolopendrium*.

growth should be fed regularly with a balanced-formula fertilizer, quarter- or eighth-strength, every three or four waterings. Unless the grower is especially fond of plant feeding chores, he can apply Osmocote slow-release fertilizer pellets to the soil mix when he is certain the plant will be in active growth for two to three months.

Ferns aren't fussy about the kind of container; it may be clay, plastic, feather rock, or whatever complementary or properly proportioned container the grower chooses—so long as it drains readily.

Ferns are not immune to pests, but the diseases that plague an outdoor grower are relatively rare under lights. Scale insects are the bane of fern growers; mealybugs, aphids and slugs are occasional aggravations. Bugs are easier to deal with in small numbers—be vigilant. Prevention through cleanliness and common sense simply cannot be overrated. If the best practices fail, use a recommended insecticide with proper care for personal safety, or use a non-chemical means, whichever you prefer. Insecticides with a petroleum base may burn fern foliage if applied in the recommended strength. Cover the plant and spray one frond, then wait a few hours before treating an entire favorite plant. If damage occurs, reduce the strength and test another frond.

What Kinds to Choose

Which ferns can be grown successfully under lights? Any and all, which is the collector's ultimate temptation. Ferns with special requirements, such as the filmy ferns which need almost 100 percent humidity, may be grown in an enclosed glass container; floating water ferns may be grown in a terrarium. The cool, consistent light of the fluorescent tube is ideal. Lack of space is the only real limitation the light gardener faces. Even though some species may outgrow the average light garden, they may be enjoyed as young plants under the lights and then slowly acclimated as well-established specimens to less ideal spots in the living area. Many ferns have a low light requirement and a need for a consistently moist soil.

Adiantum is an all-around favorite "ferny-looking" fern. Most species prefer a spot with frond tips 8 to 14 inches from a 4-tube fixture. Variegated cultivars (*A. raddianum* 'Variegatum') maintain excellent contrast at 8 to 10 inches; *A. hispidulum,* sometimes called rosy maidenhair, should be grown 6 to 8 inches from the tubes. The maidenhairs love humidity and a consistently just-moist, limey, well-drained soil and they do best when a bit rootbound. Like all ferns, except the floating genera, they will not tolerate soggy soil. For a delicate symmetry, try *A. raddianum* 'Fritz Luth', 8 to 10 inches tall at maturity; for stately plants with large pinnae (leaflets), grow *A. peruvianum,* 12 to 14 inches or *A. trapeziforme,* 14 to 18 inches; for frothy grace, try *A. raddianum* 'Micropinnulum', 12 to 14 inches; grow an *A. caudatum,* the walking maidenhair, in a feather rock container; for a special challenge, find and grow *A. reniforme,* the only *Adiantum* with a simple frond.

No light garden is complete without a mother fern, *Asplenium bulbiferum* or *A. daucifolium,* 12 to 24″. The small plantlets that form on the tops of mature fronds are a quick source of propagation material and an attractive feature on the finely cut foliage. Place the fern 8 to 12 inches from the tubes and maintain a just-moist mix.

Phyllitis scolopendrium, the hart's tongue fern, 10 to 12″, is a vigorous plant with requirements similar to *A. bulbiferum* and *A. daucifolium. Phyllitis,* however, prefers to dry between waterings. The species is particularly variable when grown from spores and offers many fascinating forms for the gardener who ventures into spore propagation. To avoid rot in the dense foliage, heavily crested forms should not be misted.

Those ferns with higher light requirements and a preference for drying out after a thorough watering are usually epiphytic varieties or those accustomed to a well-drained, rocky soil and partial sun.

Footed ferns are excellent light-garden subjects but some (*Polypodium aureum* and cultivars, 3 to 4′, *Aglaomorpha coronans,* 2 to 4′) will outgrow the average light setup after a few years and may be hardened off to places under spot or flood lamps or to natural light in the living area. Many footed varieties do remain reasonably compact: *Davallia fejeensis, D. fejeensis* 'Plumosa', 1 to 2 ′, *D. mariesii,* 4 to 8″, *Syphularia pentaphylla,* 6 to 8″. These plants may be grown in the recommended mix in a pot or in a sphagnum-lined basket. They prefer a location 6 or 8″ from the lights.

Common staghorn fern (*Platycerium bifurcatum*) and cultivars remain small enough for fluorescent light culture for many years. They require placement within 6 to 8″ from the tubes and are usually mounted on plaques or grown in sphagnum-lined wire baskets containing the usual mix, loosened with additional coarse perlite or bark chips. Goldback fern (*Pityrogramma chrysophylla*) is a terrestrial accustomed to drier conditions and high light. The gold "dust" on frond backs and stipes (stems) make it a sparkling addition to the light garden.

Nephrolepis form the backbone of indoor fern gardening and all are suitable for artificial-light culture either as small, immature plants a few inches from fluorescents, or as large, mature plants displayed as specimens or in groupings several feet from a spot or flood lamp, or in natural light. These epiphytes require a drying-out period after each thorough watering.

Both *Polypodium piloselloides* (climbing) and *P. vaccinifolium* (creeping) are charming, tiny epiphytes with 1 to 2″ ovate leaves. They are especially suitable for bark or basket culture, and both require moist conditions and placement 6 or 8″ from the tubes.

Drawings: Stanley Schwartz

Paphiopedilum venustum

Some are ideal for our purpose . . .

ORCHIDS UNDER LIGHTS

Stanley Schwartz

In automobiles it's Cadillac, in chocolates it's Godiva, in fashion it's Dior, and in plants it's orchids. All of these are associated with the best, the Olympus toward which others aspire. They each possess an unmistakable mystique. In the case of orchids this mystique is a mixed blessing. Whereas it has caused the public to prize orchids highly for their remarkable beauty, it has bred a vague feeling that orchids are infinitely delicate and difficult to cultivate outside of a greenhouse.

So successful is this myth that even experienced indoor gardeners often avoid growing orchids altogether.

Orchids are the largest family of flowering plants in the world, consisting of an estimated 25,000 species. They may be found atop mountains and in steaming jungles. They also inhabit wetland bogs, shaded woods, sand dunes, the branches of tall trees and grasslands. Because of such size and diversity, some of them, in fact a number, are suitable for growing under lights. Nevertheless, to avoid disappointment, it is important to eliminate those plants which for one reason or another are not well fitted for the purpose.

One limitation on plant selection is temperature preference. Orchids are usually classified according to their *nighttime* temperature requirements. Depending upon their needs, they are described as cool (50°F nights), intermediate (55-60°F nights), and warm (60-65°F nights). Daytime temperatures may be ten or fifteen degrees higher, but for orchids to bloom they should receive their preferred night temperature. Only warm and intermediate orchids have been considered here, for few modern homes have conditions for cool-growing kinds.

The size of certain orchids is another limiting factor. Every beginner would like to grow the cattleya, the corsage orchid with which most laymen associate the entire orchid family. However, in most cases, it is too large a plant to be manageable under lights. Mature specimens usually fill seven-to-ten-inch pots and may stand over two feet high. It is far more practical to grow plants of smaller size and to have the fun of trying a hand at a greater variety.

Another limitation on our choice of plants is their light requirements. The amount of light in an average fluorescent garden is insufficient for many orchids to flower. Therefore, plants should be selected which will bloom with moderate light. All of the orchids I discuss here have bloomed successfully under four forty-watt tubes in ordinary two-tube shop fixtures with white enameled reflectors. These fixtures are hung side by side in pairs, equipped with half cool white and half warm white tubes, and they remain lit sixteen hours daily. Cool white and warm white tubes are inexpensive and easy to find, and they seem to do the job as well as others I have tried.

Although a skilled grower may succeed with some orchids under two forty-watt tubes, four tubes are best for the new light gardener. Under two tubes, plants must be positioned extremely close to the lights. This makes watering difficult and introduces a serious heat problem. However, if two tubes is all you can provide, try halving my recommended distances from the tubes.

Moth Orchid

Native of the Asian tropics, especially Indonesia and the Philippines, phalaenopsis orchids are almost ideally suited to fluorescent light culture. They are monopodial or one-footed, which is to say, all growth comes from a continuously, but slowly, lengthening single stem. Alternate leaves which are thick, succulent and straplike appear to be growing in pairs and range from six to fourteen inches in length on mature plants. Their surface is smooth, and it may vary in color from light green through mottled green and gray to reddish above and deep wine below. A mature plant may have between four and eight healthy leaves.

The inflorescence or flower spike arises from a hidden bud along the stem and grows horizontally for a short distance before turning upward. Then, depending upon its inheritance, it may rise six inches to three feet before its buds swell and open. At this time the weight of the open blooms will often cause the spike to bow downward in a graceful curve. If the angle of the flower spike to the light has not been altered during its development, all of the flowers will be oriented in the same direction, and it will be clear why the phalaenopsis or "moth orchid" has been so named. The blooms take on the appearance of an arching formation of moths, hovering in the air.

Phalaenopsis blossoms may be white, pink, yellow, red-lipped, spotted or striped. Their size may be under two inches or over five inches across. With

A *Phalaenopsis* hybrid. Many are ideal candidates for a light garden.

favorable conditions, individual blooms may last more than a month. Then, as they begin to fade, the spike usually elongates and new buds replace those that are lost. Depending upon the plant, a spike may hold one or a dozen blooms at a given time, and more than one spike may be present. It is not rare to find a plant which is in flower all year long.

Phalaenopsis, like most of the orchids discussed here, is epiphytic, which means it depends upon another plant, usually a tree, for support. It is not a parasite since it derives its nourishment and moisture from the air. Because its roots must be in contact with the air, an epiphyte cannot grow in potting soil. The medium most often used for potting epiphytes is shredded fir bark, which is available in fine, medium and coarse grades. Mature plants require a coarse mix composed of chunks 1½″ in diameter. Smaller plants require progressively finer grades. When potting phalaenopsis, don't break the white fleshy roots as you distribute the bark under and around them. Nor should you try to get every last root into the pot. It is natural for some to stick up into the air. I pot phalaenopsis and most other orchids in plastic containers. Except for plants which are subject to root rot, it is unnecessary to use crocks in the bottom of pots. However, if you have a heavy hand with the watering can, use clay pots and crocks until you get the feel for watering. You will seldom kill an orchid by underwatering a little, but a short period of overwatering is likely to prove fatal.

Since phalaenopsis lack "bulbs" to store water as some orchids do, don't let plants go bone dry. Be especially careful with newly potted ones. They may need watering more often than usual because fir bark is moisture resistant until it begins to break down. To avoid this problem, before potting I put the bark into a tub and cover it with boiling water. After soaking for an hour or two the bark is cooled and will hold water immediately. In watering, aim for a slightly damp but never soaking mix, and allow the top inch or two to dry before rewatering. Finally, when in doubt, don't water!

Phalaenopsis and most other epiphytic orchids need a bit more humidity than African-violets, about 50 to 60 percent.

They will tolerate somewhat less, but use trays of pebbles kept moist or a humidifier to raise the humidity if you seek optimum results.

Along with high humidity, orchids require gently, constantly circulating but not drafty air. They detest stale, stagnant air. Keep a small fan going day and night in the vicinity of, but not pointed directly at, your orchids. Failure to attend to this may result in mildew or other fungal disease.

Orchids potted in fir bark require a 30-10-10 fertilizer, which is to say, one with a high proportion of nitrogen. This is to compensate for the nitrogen lost as a result of the bark's gradual decomposition. For other potting mixes, a balanced house plant fertilizer such as 10-10-10 is satisfactory. I fertilize at one-quarter strength every other watering while the plants are in active growth. At intervals, especially when a whitish fertilizer deposit becomes visible on the surface of the bark, pour copious amounts of water through the previously wetted mix to dissolve and leach out potentially harmful salts.

Phalaenopsis are among the warm-growing orchids, performing best at 75°F during the day and 65° at night. In the fall, when most phalaenopsis initiate their flower spikes, give them a night temperature of 60° for several weeks. This almost always succeeds in getting a spike started. As soon as the spike appears, normal night temperatures can be resumed, and blooming will occur in three months. When it appears that there will be no further blooming, the spike may be cut back one-third of its length to a node above the place where the first flower appeared. Often, the spike will send out a secondary branch from this point and begin blooming again. In fact, a single spike will sometimes bloom for several seasons and should not be removed until it is clearly dead.

I grow my phalaenopsis about twelve inches from the tubes. They sit on inverted plastic berry boxes, but upturned pots would be equally serviceable. The point is to permit air circulation beneath as well as above the plants, and to prevent them from touching the water kept in trays below them to raise the humidity. Phalaenopsis' one drawback for fluorescent light gardening is their tall spikes. There are several solutions. One is to reserve a light unit specifically for these tall plants, and to raise the lights as necessary to avoid burning the spikes. Another is to remove the plants from the lights proper and place them alongside the lights with only the spikes under the lights. Finally, it is possible to select plants which do not grow tall spikes at all. Although these are usually small-flowered species, they are invariably charming, durable and easy to grow. Among the last, I suggest you try *Phalaenopsis parishii* 'Lobbii', which is white with brown bands on its lip; *P. lueddemanniana,* which has colors from wine through yellow and cream and may be nearly solid or barred or banded; *P. violacea,* which is beautiful in both its Bornean and Malayan forms. In both instances the blooms are primarily a creamy white with green tips and red-purple centers. In the Borneo form the colors are distinct, while in the Malay form they blend gradually.

Among the large-growing phalaenopsis orchids it is virtually impossible to make recommendations because there are so many excellent hybrids to choose from. Send for the catalogs of a few reputable dealers and make selections from among the flowering-size plants they offer. Base your decision upon taste in color and pocketbook. Finally, until you have some experience in growing these plants, don't invest in the most recent hybrids, which may be extremely costly.

Paphiopedilum and Oncidium

The paphiopedilum or lady's slipper orchid, (not to be confused with the *Cypripedium* of outdoor gardeners) is another genus which grows well under lights. Unlike phalaenopsis, paphiopedilum growth is sympodial. This means that at the end of each growing season a new lead or branch appears from the base of the plant. This growth matures and eventually flowers. Having once flowered, a growth never blooms again. Instead, it gives rise to new growths which will flower the following season.

Paphiopedilums are usually divided into warm- and cool-growing species. In most

Equitant (overlapping-leaved) oncidium growing on a cork raft.

cases the two can be distinguished by their coloring. Cool species have solid green foliage and warm growers have foliage that is mottled. All the species discussed here are warm-growing or tolerant of warmth.

Paphiopedilums are terrestrial orchids and so require a more moisture-retentive potting mix than epiphytes. I use equal parts medium-grade fir bark, shredded tree fern, and African-violet soil. A half teaspoon of ground dolomitic limestone added to each 6″ pot is beneficial. Keep this mix uniformly moist but never soggy. When watering, avoid wetting paphiopedilum leaves and, especially, flower buds since they are subject to mildew and other fungi. In other regards paphiopedilums are grown under lights as outlined for phalaenopsis.

Under good conditions blooms may last three to six weeks. In some species a flower stalk will bloom successively, and as one flower fades another will appear. In others, several blooms may open at the same time. Most often, however, each growth gives rise to a single blossom. Flowers may be in combinations of yellow, green, brown, red and purple, and will range from two to five inches across. *Paphiopedilum barbatum, P. godefroyae, P. concolor, P. bellatulum, P. venustum* and *P. glaucophyllum* are recommended. The last blooms successively for several months during the fall and winter and is my favorite.

Another excellent light gardening subject is the equitant oncidiums. These are fan-shaped and only three to six inches in height. Although in nature they require high light, they do well in the light garden if kept three inches from the center of

ORCHID	SEASON	LIGHT	MOISTURE	TEMPERATURE
Brassavola nodosa	SU-F	H	T	I
Epidendrum bractescens	F-W	H	T	I
Epidendrum cochleatum	SU-F	M	T	I
Epidendrum fragrans	SP-SU	M	T	I
Gastrochilus acutifolium	SP	M	T	I
Gastrochilus bellinus	SP	M	T	I
Gastrochilus dasypogen	F	M	T	I
Leptodes bicolor	W	H	T	I
Leilia pumila	F	H	T	I
Maxillaria sanguinia	W	M	T	I
Maxillaria variabilis	W	M	T	I
Miltonia clowesii (tall)	F	M	P	I
Oncidium ornithorhynchum	F	M	T	I
Pleurothallis sanguinia	W-SP	M	T	I
Rodriguezia secunda	F-W-SP	M	T	I

KEY

Blooming season (this may vary considerably under lights)
SU = summer W = winter SP = spring F = fall

Light (distance of plant top from center of 4 four-foot tubes)
H = high light—3 inches
M = medium light—6 inches
L = low light—12 inches

Moisture
C = constant moisture (never soggy)
P = partial drying between waterings
T = thorough drying between waterings

Temperature—minimum nighttime
W = warm—60 degrees
I = intermediate—55 degrees
C = cool—50 degrees

four tubes. These orchids must dry out thoroughly between waterings and so are often grown attached to cork or tree fern rafts instead of in pots. Such plants must be misted daily, given a weekly soak in a mild fertilizer solution for a few minutes, and kept somewhat cooler in winter than in summer. When so treated they will reward the grower with lovely sprays of delicate blooms in shades of white, yellow, brown, pink, rose and lavender. Among the species, I recommend *Oncidium pulchellum, O. pusillum* and *O. variegatum.* Among the hybrids I am especially fond of *O.* 'Catherine Wilson', which blooms with remarkable freedom under lights.

An Orchid Table

Numerous other orchids can also be successfully cultivated under lights. The table above will provide some clues to the cultural requirements of the species I recommend.

It should be noted that the table contains only species. This is because they are the most universally available orchids and usually the least expensive. This makes them ideal for those getting started in light gardening. With experience the new grower will no doubt add many of the spectacular hybrids to his collection.

Three closing notes. First, experience has taught fluorescent light gardeners that plants do not always behave under lights as they do in natural daylight. Sometimes a plant which is easily grown on the windowsill will not perform well under lights. More often, the reverse is true. However, if an orchid fails to perform for you as you think it should, give it time. It is not unusual for an orchid to sit for a year or more before getting accustomed to its light garden home.

Second, among all plants but especially among orchids, the selection of good "bloodlines" is important. Often, when a plant fails to do well for you but succeeds for a friend who got his specimen from a different source, the answer may be that he has a superior clone. Therefore, whenever possible, try to get your plants from someone who has grown them under lights.

Finally, remember that, by and large, orchids are tough customers. Although they may take their time in becoming acclimated to your home, they usually have the endurance to last until you learn how to succeed with them. Then they will amaze you with their beauty, durability and longevity. ❧

Photos: M. Joyner

Sinningia barbata

From one of the first families of house plants . . .

OUR FAVORITE FIVE GESNERIADS

Stan and Floss Dworkin

Not every relative of the African-violet is perfect for growing under fluorescent lights: the Gesneriaceae is a large family and, as in any large family, there are always a few that stand quite far from the norm. Some are alpines and require a winter freeze to do well, others grow too tall or are too pendulous for the average fluorescent-light garden. However, gesneriads as a group are the finest plants for any light unit. There are miniatures that will flower under single tubes, hanging basket and rosette forms that will thrive under two to four tubes—and, generally speaking, the spectra don't matter. We have flowered gesneriads under cool white tubes as well as under every one of the special spectrum tubes, without supplementary daylight or incandescent light.

Here are five genera that anyone can grow successfully in almost any fluorescent-light garden.

Sinningia

This genus includes plants that will flower in a thimble and others that will flower in a bushel basket. The hybrids of the florist gloxinia (*Sinningia speciosa*) are the best known to most people. Burpee was selling seed for gloxinia in its 1894 catalog. These large-leafed and large-flowered plants have their size determined to some extent by pot size; that is, if two tubers of the same age and size are grown in two different-sized pots, the tuber in the larger pot will give the larger plant (and more flowers). This means that the light gardener with limited space can keep gloxinias in rather small, say 4″, pots and expect compact plants 10″ to 12″ across

Episcia 'Ember Lace' has cultural needs typical of the group. Its pink, white and green foliage is striking under lights.

—still healthy, beautiful and floriferous but kept smaller by the small pot.

A fairly recent development is the hybridization of gloxinias that will stay compact, even in larger pots. Lyndon Lyon's *Sinningia* 'White Swan' is a beautiful example, and very floriferous.

Gloxinias do well under two fluorescent tubes of mixed spectra but even better under three or four tubes. Grow them as close to the tubes as possible without burning their leaves, and keep them moist while in bud or flower. Keep the relative humidity in the range of 40 percent.

Another group, the miniature sinningias, can indeed be quite tiny, and many of them are most appropriate for terrariums, as they require constant moisture and high humidity. The old standbys, *Sinningia pusilla* and its sport 'White Sprite', are still delightful and very tiny. *S*. 'Cindy-Ella' is also appropriate for terrarium culture, but it makes a much larger plant with larger flowers. The tiny miniatures will flower under a single tube of cool white light, if grown right against it. Otherwise, grow them six inches from a two-tube fixture.

Koellikeria

Koellikeria erinoides grows from a scaly rhizome, an adapted stem but hard to recognize as such. In this case, the rhizomes look like very small, pale elongated pine cones. Each scale is capable of growing a whole plant, but with any scaly-rhizome gesneriad, in practice, it is better to use a chunk of rhizome.

Koellikeria is a true gem. If grown in a terrarium, it is care-free; it requires no fertilizing if it is grown in a soil mix containing actual soil and just an infrequent watering to keep the soil of the terrarium evenly moist. Its leaves are small, heart-shaped, wine-colored below, green above, and silver spotted. The flowers are tiny but borne on a stem high above the foliage. They are orchidlike and produced by the score.

Koellikeria flowers profusely under two fluorescent tubes. After bloom it will begin to go downhill, but seeds can be gathered and started immediately for new plants. Also, the rhizomes can be harvested when the foliage withers, and then set into fresh soil.

Gesneria

This is the genus for which the famous family was named. It is not nearly so widely grown as other members of the clan, largely, we think, because it is quite particular about watering. *Gesneria* has no storage capabilities and so will die if it goes dry. It is a perfect candidate for growing on a capillary mat. (See page 11.) Kept evenly moist, it will flower generously under two fluorescent tubes.

Gesneria 'Lemon Drop' is a beautiful hybrid with bright yellow flowers which makes a slightly larger plant than most in cultivation. While other gesneriads are quick and easy to propagate, the gesnerias are slow. This makes new hybrids expensive.

Episcia

There is such variety among episcias that it is difficult to pick favorites. They are the rex begonias of the gesneriad world, grown primarily for their bright and colorful foliage. Excellent leaf color will be produced even under a single fluorescent tube, though the plant shape will not be as compact as it will be under two tubes of any spectrum. Flowering is superior under two or more tubes.

Episcias don't require evenly moist conditions, but they will droop and burn if allowed to go quite dry. Keep clipping the stolons (runners) to make the leaves of your episcia larger. And, of course, use the stolons as propagation material if you want more plants. They root rapidly. There are two pink-leaved episcias, *E.* 'Cleopatra' and *E.* 'Pink Brocade', which require higher humidity and more moisture to do well.

Saintpaulia

Finally, we would like to recommend to you the African-violets (*Saintpaulia*). They have been the subject of more hybridization than any other house plant. And they are at their most magnificent when grown under fluorescent lights.

In the fluorescent-light garden, saintpaulias grow more compactly and produce more flowers. They will grow best under a four-tube fixture, with room between plants, even moisture when in bud or flower, and moderate humidity. They require good ventilation in summer or the heat under lights may burn their leaves.

We won't go so far as to say that there is no other family that has plants that will grow well under fluorescent lights, but we will say that there is no family of plants that grows with such variety and so well under fluorescent lights. ☘

Compact and floriferous, *Saintpaulia* 'Tommy Lou' has dark green leaves with white edges.

The author's light gardening room

For abundant flowers and lower electricity bills . . .

SHORTER LIGHT PERIODS FOR BEGONIAS

Jack Golding

For many years, to obtain flowers on the begonias in my light gardens, I have experimented with their response to the relative length of light and dark periods. The results of my most recent experiments to conserve electricity show that begonias, and probably many other plants, can be grown with much shorter periods of light than was thought in the past.

Plants have been categorized as short, long or indeterminate day plants, to indicate which will bloom when the days are short (winter) or long (summer) or indeterminate (doesn't matter). These designations are misleading however, because plants are induced to bloom by the length of the period of total darkness. The plants seem to have a built-in clock to time the length of the dark period. If the total darkness is interrupted by either a few seconds of bright light, or low intensity stray light, the clock is stopped and the plants react as if the nights were short.

In the late 1960's, I suggested growing begonias with light periods of sixteen to eighteen hours per day. Rhizomatous begonias bloom in natural light when the long nights of winter change to the shorter nights of spring. To induce these types of begonias to flower in light gardens, I recommended simulating this change by starting with fifteen hours of total darkness (nine hours of light), and at two week intervals, reducing the dark period by one hour until the dark period was only twelve hours. The rhizomatous begonias bloomed beautifully with this schedule.

In the 1970's, as the cost of electricity increased, we reduced the light periods from sixteen to eighteen hours to twelve to fourteen hours and our mixed collection of begonias continued to grow well. The schedule for inducing rhizomatous begonias to flower was revised. It started with thirteen hours of darkness and was reduced by one hour every three weeks until ten hours of darkness was reached. Again, all begonias thrived and bloomed well.

Lighter Load, Lower Cost

This past year, my local utility company advised that if I could reduce my electrical load during the daylight hours, it would sell me the electricity I used between the hours of 9:00 PM and 7:00 AM at approximately 50 percent of the normal cost. Since the electricity for my light gardens accounts for a large part of my monthly bill, I decided to accept their offer. Night and day have since been reversed in my light gardens and for the ten hours between 9:00 PM to 7:00 AM the lights are on. The windows in my light garden rooms are shaded and my plants have fourteen hours of darkness.

The results have been pleasing. I expected the rhizomatous begonias to grow and flower with the long nights, but they have even more flowers and for longer periods than ever before. As the flowers are finished on one peduncle a new cluster is ready to replace them. And I have also been delighted to see many of the shrublike, canelike, and semperflorens (wax) begonias full of flowers.

To accomplish these results, the quality and quantity of the lights on the plants must be good. In my light gardens I use a one-to-one combination of deluxe cool white and deluxe warm white fluorescent lamps. Most are 96″ long reflector fixtures with two 75-watt lamps; some have four 75-watt lamps, and some have two 110-watt high output lamps. In short areas, there are a few 48″ (40-watt) fixtures. The growing benches are located at the distances recommended in the "Light Garden Basics" article in this Handbook. The tops of some plants almost touch the fluorescent lamp, but if they begin shading the lower plants, I either move them to a larger garden or prune them.

Photos: J. Golding

Begonia 'Essie Hunt' successfully flowered in reduced light periods in the author's light gardening room.

In my 12′ x 16′ garden room, illuminated by 48 deluxe cool white and deluxe warm white 75-watt lamps on 6″ centers, the intensity of approximately 300 foot-candles is uniform throughout the room, even at the floor 7½ feet below the lamps.

Some begonias that bloomed in my light garden the past few months are: *Begonia acida,* 'Aladdin', 'Angie', 'Baby Perfection', 'Beverly Jean', 'Black Raspberry', *borneensis,* 'Bow Arriola', 'Carlsbad', 'Chantilly Lace', 'China Doll', 'Chumash', *conchifolia, cucullata,* 'Emerald Lacewing', x *erythrophylla* 'Helix', 'Essie Hunt', *glabra, heracleifolia* var. *nigricans,* 'Laura Englebert', 'Lenore Oliver', 'Los Angeles', 'Mabel Corwin', *macdougallii, malabarica,* 'Marguerite De Cola', 'Ministar', *olsoniae, paleata, peltata,* 'Persian Brocade', *popenoei,* 'Red Eye', 'Ricky Loving', *schmidtiana, sementacea* (of the trade), *sharpeana,* 'Sisquoc', *solananthera,* 'Stallion', *subvillosa,* 'Sunderbruchii', 'Texastar', 'Tingley Mallet', 'Virginia Owens', *vitifolia;* also *semperflorens* cultivars 'Danica', 'Fireball', 'Foremost Pink', 'Lady Frances', and 'Linda'.

More options for the outdoor garden when. . .

GETTING STARTED WITH SEEDS

Mary Ann McGourty

No matter where a gardener lives, he is always looking for ways to lengthen the growing season. He wants marigolds to bloom a little earlier and to have the first ripe tomato on the block. A headstart on spring can be gained by setting out seedlings as soon as weather permits, instead of waiting to sow seeds outdoors. This is especially important in areas where spring comes late and the growing season is short.

Some Advantages

By starting plants from seed, rather than buying seedlings, the gardener will also find considerable financial savings. A garden full of colorful flowers and luscious vegetables can be had for the price of but a few packages of seeds. In addition, there is a remarkably wide range of plant varieties in the catalogs of specialty seed suppliers, varieties which are not usually available in local garden centers.

Fluorescent lights provide an ideal vehicle for starting seeds indoors. During those gray days in late winter when it seems that spring will never arrive, every day is sunny and warm in the fluorescent light garden. Although the artificial light is not as intense as sunshine, the light source is constant. Since the light comes from directly overhead, plants tend to grow straight, instead of leaning toward the light as they do on a windowsill.

Under fluorescent light there is no significant heat build-up to cook tender seedlings. The young plants thrive in the increased humidity created by a closed plastic container. It is not possible to use this technique with the sun as the light source, because the heat concentration would fry the okra before it even flowered.

Growth

The most frequent mistake made when sowing seeds indoors is starting too soon. If plants become large and potbound before it is time to put them into the garden, their growth will be checked and the advantage of an early start will be lost. Upon germination, most seedlings grow rapidly and soon outstrip the confines of their appointed space, becoming difficult to handle. A friend of mine recently grew seedlings of black-eyed Susan vine *(Thunbergia alata)*, which quickly twined around the light fixture and were last seen heading for a nearby bookcase. The object is to keep plants in slow, steady growth from the time seeds germinate until plants are set out in the garden.

Seed packets indicate how much lead time is needed. Perennials and those annuals which are slow starters, such as petunias and semperflorens begonias, can be sown in early March in the northern states. Most annuals take six to eight weeks, so begin them in late March (or six to eight weeks before the average date of the last frost in your area). Cucumbers and squash are ready to set out four weeks after seeds are sown. Lettuce, peas, onions and the cabbage clan tolerate some frost so they can be started early and then transplanted to the garden after hardening off. This will make room under the lights for more tender plants which must be kept indoors until the danger of frost is past.

The requirements for good seedling growth are not difficult to meet: clean containers, pasteurized growing medium, adequate water and light. Any container will do as long as it is clean, has drainage holes in the bottom and has room for a two-inch depth of growing medium. Flats 9″ × 12″ are convenient to handle and will hold several kinds of seeds. Small amounts of seeds can be sown in individual pots. To avoid introducing disease, rinse containers before use with a solution of nine parts water to one part chlorine bleach. Let containers drain dry.

B. Howard. Photography Unlimited

In this seedling nursery under lights the upper shelf holds first transplants in plastic boxes to keep the humidity high. The lower shelf has other seedlings already hardened off.

Starting Right

There are many favorite starting mixes. The commercial soilless ones are easy to use, or you can make your own. A tablespoon of dolomitic limestone added to each quart of mix will encourage good growth for most plants. Impatiens, however, sulks when lime is added, so omit it from the diet. The choice of medium is optional, but it should be pasteurized and porous. The mix should retain enough moisture so it dries slowly, yet it must allow excess water to drain away. Fill the container to one-half inch from the top. This allows better air circulation, which in turn discourages fungus diseases. Thoroughly dampen the mix and allow the excess to drain from the container before sowing seeds.

Many of our favorite annuals and vegetables come from the subtropics and require warm temperatures for best germination. Especially now that energy-conscious homeowners keep their thermostats at lower settings, a heating cable under the growing medium in the bottom of the seed flat gives that little extra warmth that many seeds need. Electric cables in varying lengths, preset to keep the soil temperature at 70°F, are readily available in garden centers. Seed packets usually indicate whether "bottom heat" helps germination.

Begin with seeds known to be fresh and viable. Sow them evenly and thinly, so that emerging seedlings will not crowd one another before they are large enough to transplant. Very small seeds may be just pressed into the medium and not covered. Larger seeds should be covered with a thin layer of medium. If the seeds are sown in rows, instead of randomly scattered, there is less likelihood of a total loss to damp-off, should it occur at all. Damp-off seems to march down the rows, rather than traveling cross-country. Make a plant label for each row, noting seed variety and date of sowing. Water the flat or pot again from the bottom and let it drain well. Cover the container with plastic wrap or enclose it in a plastic bag, taking care that the cover does not touch the medium.

Any two- or four-tube fluorescent fixture with a reflector will provide the light needed. Warm white and cool white tubes in a 1:1 ratio are economical and effective. Position seed flats under lights so the surface of the medium is 4-6″ from the tubes. Give them fourteen to sixteen hours of continuous light each day. An automatic timer will keep you from becoming a clockwatcher. After seedlings appear, keep lights 6″ from the top leaves for bushy, compact growth. The distance can be regulated by raising or lowering the fixture on a chain or by positioning the flats on upturned pots to the proper height.

Culture

Most young plants are not unduly particular about temperatures; if you are comfortable, so are they. Annuals seem to grow best with a night temperature of 55-60°F; daytime temperature can be 5-10° warmer. Too much heat encourages rangy growth and weak stems.

Check seed flats daily for dryness, and keep the medium damp but not sopping wet. Do not assume that the mix is adequately moist simply because there is condensation on the plastic cover. When seedlings appear, gradually remove the plastic and continue to water as needed. If seedlings dry out even once, their only use will be as fodder for the compost heap. Flats may be watered from the top or the bottom. If watering from the top, aim a gentle stream of water below the rows, taking care not to wet the leaves.

It is time to transplant seedlings when the first pair of true leaves appears and the plants are large enough to handle. Transplant them into individual pots, market packs or other flats. Spacing 2″ apart in flats allows room for both root and top growth. The transplant medium can be more soilless mix or, preferably, a soilless mix containing part pasteurized garden soil to prepare the roots for the heavier soil in the garden. The seedlings should be returned to their place under the lights with the tops of the leaves 6-8″ from the lights. If transplants seem droopy, they can be revived by placing the flats in a lucite sweater box, from which the cover is gradually removed over a period of a few days.

Soilless mixes contain few nutrients, so transplants must be fertilized during their active growth. Feed them every ten days with a one-quarter strength solution of a balanced water-soluble fertilizer. As the time nears to move the plants to the garden, withhold watering slightly and begin to harden them off by placing them outdoors in a protected location for increasing periods of time.

The culture for plants grown under fluorescent lights is essentially the same as for those grown in sunlight, with one exception. Seedlings under lights tend to dry out more quickly and require more attention to watering.

The two problems most likely to occur are unduly rapid growth and damp-off. The former can be controlled by reducing the temperature and the amount of water plants receive. Damp-off is best controlled by prevention. Clean containers, pasteurized mix, good air circulation and proper watering techniques should keep this problem out of your light garden. If it does appear, apply an appropriate fungicide as a soil drench.

Other Possibilities

Fluorescent light gardening offers other possibilities for the home gardener, including winter color indoors. Many of the low-growing annuals can be started from seed in autumn and will be blooming by Christmas and continue through the winter. Also ferns, both tropical and hardy, do well when started from spores under lights. (See BBG *Handbook on Ferns* for a description of the method.) Moreover, many hardy trees and shrubs can be started from seeds under lights. Most require a preliminary cold treatment of sixty to ninety days, and some are naturally slow to germinate. A number of trees and shrubs can also be propagated under lights from semi-softwood cuttings.

Tender herbs can be grown from seed under lights with a marked degree of success both for culinary use year-round and to winter over certain plants that cannot survive freezing temperatures in the outdoor garden. Keep the growing tips pinched for tidy, compact growth and watch for white fly infestation. Another use of lights which has increasing appeal these days is the culture of a variety of small-leaved subtropical plants for bonsai. For more information on this fascinating subject, see BBG Handbook *Bonsai for Indoors*. ✤

Before you begin, learn about some . . .

LIGHT GARDENING BASICS

Jack Golding

Illustrations by Marilyn White

Good light is the primary element required for indoor gardening. In the past, indoor gardens were tethered to windows to obtain the maximum amount of natural light. As a rule, with the plants growing towards the light, the most attractive part of the garden faced away from the viewer. But, today, by using artificial light, indoor gardens can be located anywhere, brightening even the darkest corners of a home.

Working gardens, which are usually located in basements or other out-of-the-way places, are used for propagating and growing plants. No effort is made to conceal the light fixtures and the other mechanics of the garden. In this category are most of the ready-made commercial light gardens with their metal or wood frameworks supporting the light fixtures and trays. They are efficient, but not the type of apparatus most people want in the living quarters.

A show garden, on the other hand, blends into the decor of the home. The light fixtures and structure should be almost invisible. The best show gardens I have seen were designed and custom-made by their owners to fit into their available space. In this Handbook, photographs of light gardens show many different types to suggest possibilities for adaption in the home.

An understanding of the following light garden basics will help you design a good light garden and bring the continuing beauty of flowers into your home.

Sources of Light

The most readily available sources of indoor lights are incandescent and fluorescent lamps. The regular incandescent and the newer mercandescent (a combination of mercury, incandescent, and fluorescent) lamps with built-in reflectors are used as spot, or flood lights. These types of lamps generate a considerable amount of heat so it is necessary to mount them at least four feet away from the top of the plants, resulting in diminished light intensity on them. The pattern of light from these lamps is circular and the intensity away from the center drops off rapidly. These lamps can be used for the decorative illumination of plants but are seldom satisfactory for growing.

The best source of light for indoor gardens is fluorescent lamps. They are more efficient, distributing light more uniformly and generating little heat.

Stated simply, light primarily of the blue part of the spectrum affects the growth of plants, while the red colors affect the flowering of plants.

The first fluorescents designed as plant growth lamps emitted light predominantly in the blues and reds; they have a purplish glow that gave plants an unnatural look. The first white and daylight fluorescents used for general lighting were "cold," emitting colors primarily in the blue, green and yellow range.

Fluorescent lamps are now made to emit light in any or all colors. The newer growth lamps diminished the purplish glow by reducing some of the blues and reds, and adding other colors. The later cool white and warm white lamps had a wider spectrum made warmer by adding red. The newest deluxe cool white and deluxe warm white lamps have even more red added to their spectrum. Lamps duplicating the color of natural daylight are also used to grow plants.

Because the first fluorescent lamps had practically no red in their spectrum, incandescent lamps were added to the earliest light fixtures designed for growing plants. But now, with the more complete spectrum of the modern fluorescent

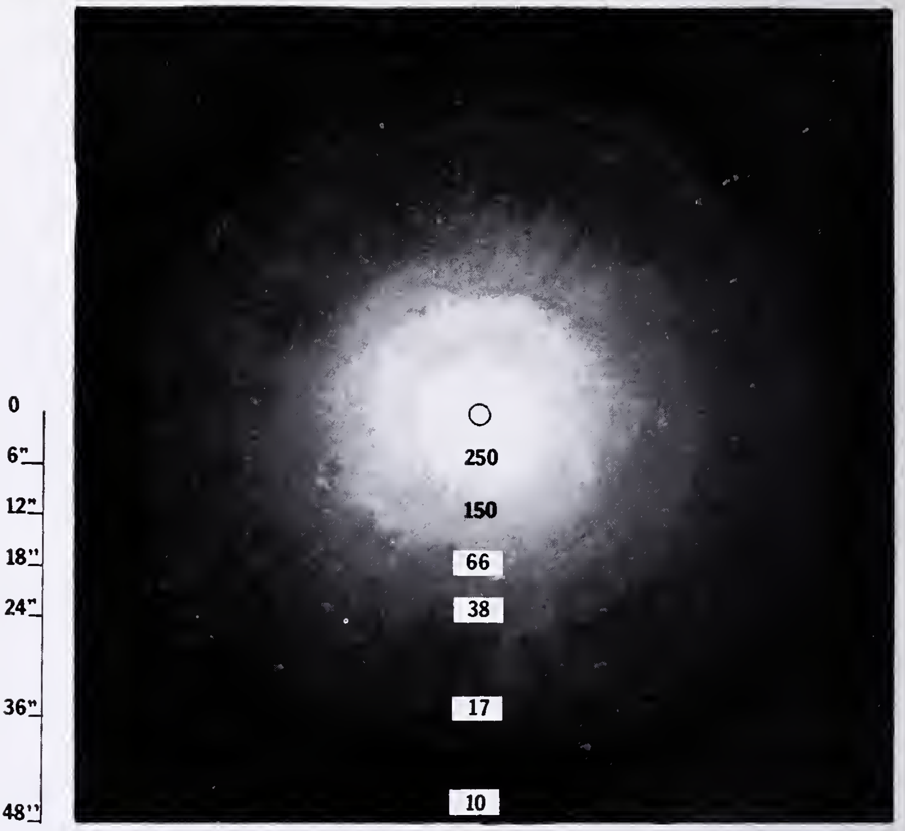


Fig. 1. Light radiates uniformly in all directions from the source and the illumination on a surface varies directly as the amount of light emitted by the source and inversely as the square of the distance between the source and the surface.

lamps, particularly in the red part, incandescents are not needed and just add unwanted heat to the gardens.

In the past, I have grown good plants with all these lamps, either alone or in combination with each other. But, for the last several years, I have been using a one-to-one combination of deluxe cool white and deluxe warm white fluorescent with excellent results. As will be noted, the other authors in this handbook also have their preferences.

Reflectors, Compounding Effect

Always use a light fixture with a reflector that deflects the light downward to the growing surfaces. A comparison of Fig. 2 with Fig. 4 shows that intensity of the light under the lamp with the reflector is approximately 80 percent greater than the lamp without the reflector. The comparative intensity and the distribution of light under various light fixtures are given in the Figs. 2 through 11.*

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*To simplify the comparison of the different light patterns, all the footcandle readings were taken under cool white fluorescent lamps with a General Electric Model 214 light meter. Because it is designed to "read" the spectrum of natural daylight, the readings will not be "true" with lights of different colors, but it is still useful for comparing the relative intensity of light in various sections of the light garden.

For growing flowering plants, the size of the growing areas and their distance below the lights are indicated in the illustrations. While these recommendations will be satisfactory for many plants, they are mainly intended as a place to start, since actual requirements vary for each type of plant. The best indicators are your plants; with good light, they will grow, be compact and have abundant flowers.

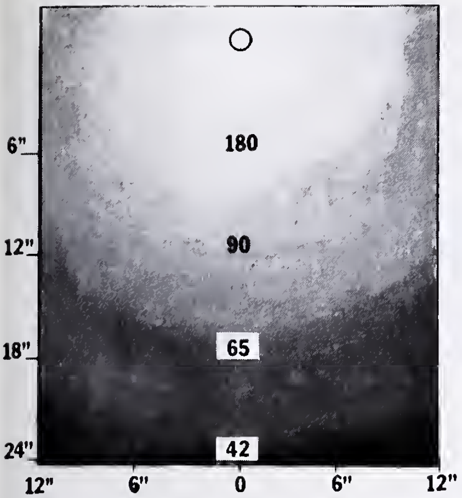


Fig. 2. 40-watt (48″) lamp, no reflector

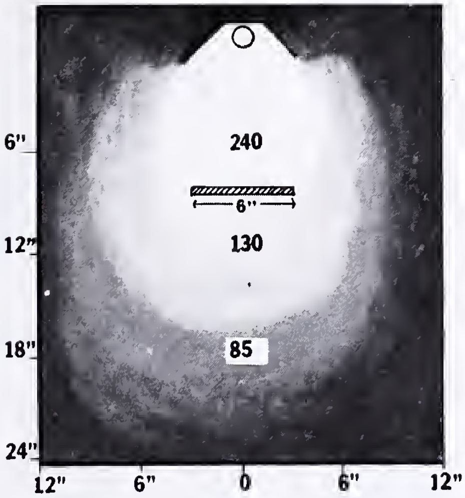


Fig. 3. 20-watt (24″) lamp with reflector

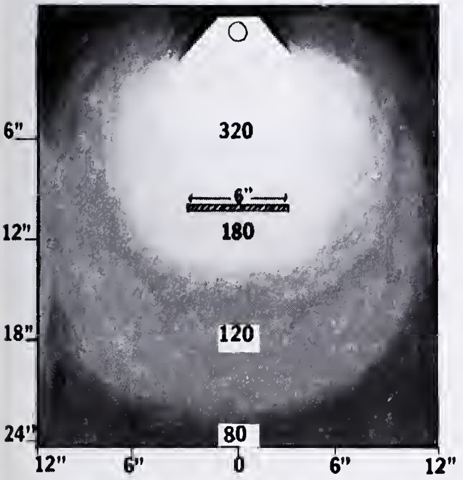


Fig. 4. 40-watt (48″) lamp with reflector

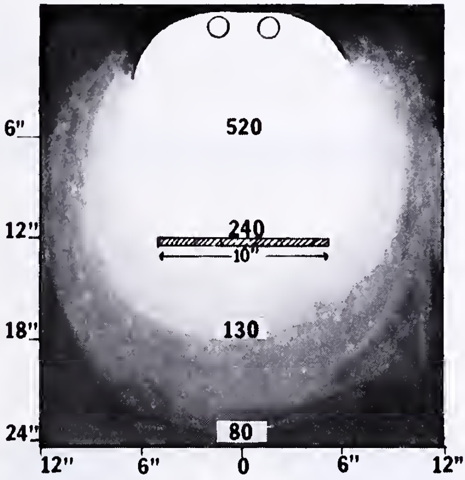


Fig. 5. Two 20-watt lamps with reflector

LIGHT DISTRIBUTION UNDER CENTRAL AREA OF FIXTURES

Light is emitted uniformly along the entire length of the fluorescent lamps. At a point on the surface under the central area of the tube, the intensity of light is increased by the compounding effect of light radiating not only from directly above but also from either side. But the light at a point under the end of the lamp is less because it is only compounded by light coming from above and the center area. This causes the intensity of the light on the surface to diminish beginning at a point approximately twelve inches from the end of the tube.

The amount of light on a surface can also be increased by using a larger lamp directly overhead, or by adding more lamps. With incandescent lamps, increasing the wattage (size) is self-defeating because the larger lamps generate more heat, making it neces-

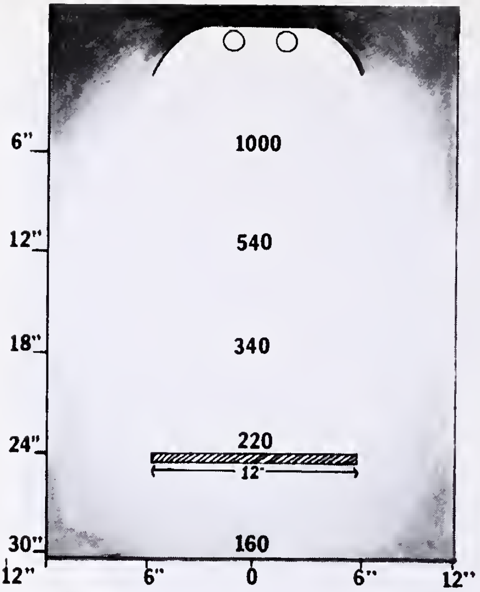


Fig. 6. Two 40-watt lamps with reflector. Light distribution under central area.

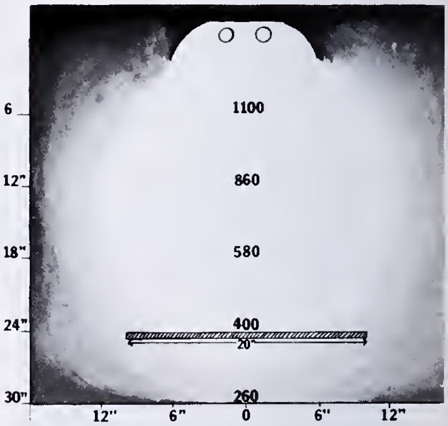


Fig. 7. Two 110-watt (96″) high output lamp with reflector. Light distribution under central area.

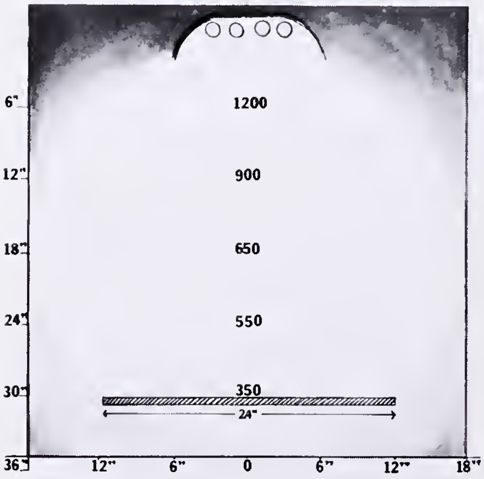


Fig. 8. Four 40-watt (48″) or four 75 watt (96″) with reflector. Light distribution under central area.

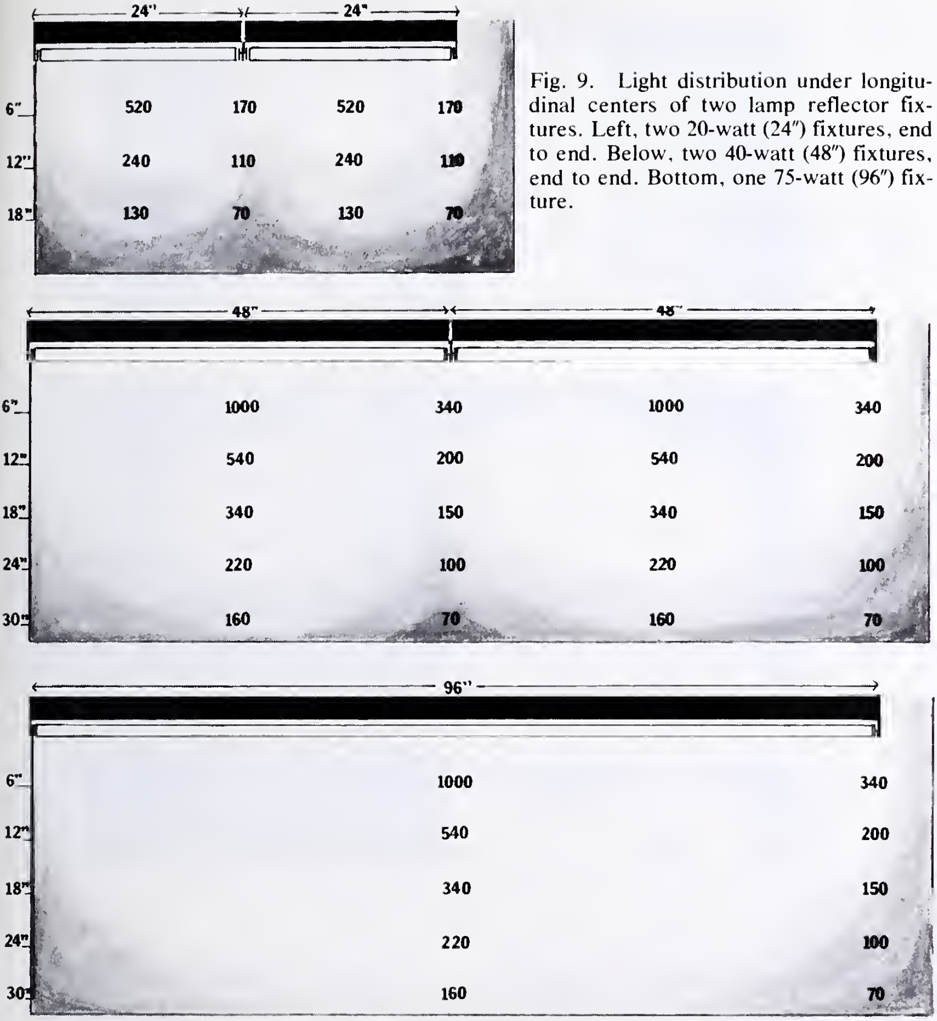


Fig. 9. Light distribution under longitudinal centers of two lamp reflector fixtures. Left, two 20-watt (24″) fixtures, end to end. Below, two 40-watt (48″) fixtures, end to end. Bottom, one 75-watt (96″) fixture.

COMPARISON OF THE COMPOUNDING EFFECT

sary to move the plants further away. The intensity of light on the plants is then almost the same as before.

The standard (T-12) fluorescent lamps have tubes with a 1½ inch diameter and varying lengths; a 20-watt has a tube 24″ long, a 40-watt is 48″ long, and a 75-watt is 96″ long. The light emitted along the length of these lamps is the same for the 40- and 75-watt lamps, and the light emitted from a 20-watt lamp is only 83 percent of them. But the actual light on a surface 12″ under the center of the 20-watt lamp is only 72 percent of that under the center of a 40-watt lamp. The difference is because the increased light, resulting from the compounding effect, is less under the shorter tube.

Fig. 9 illustrates the distribution of light under the lengths of different fluorescent lamps. To illuminate long areas, it is best not to use smaller fixtures end to end, but to use the longest fixture possible.

For wider light gardens, use additional fixtures as illustrated by Fig. 10. Note the increased light intensities resulting from

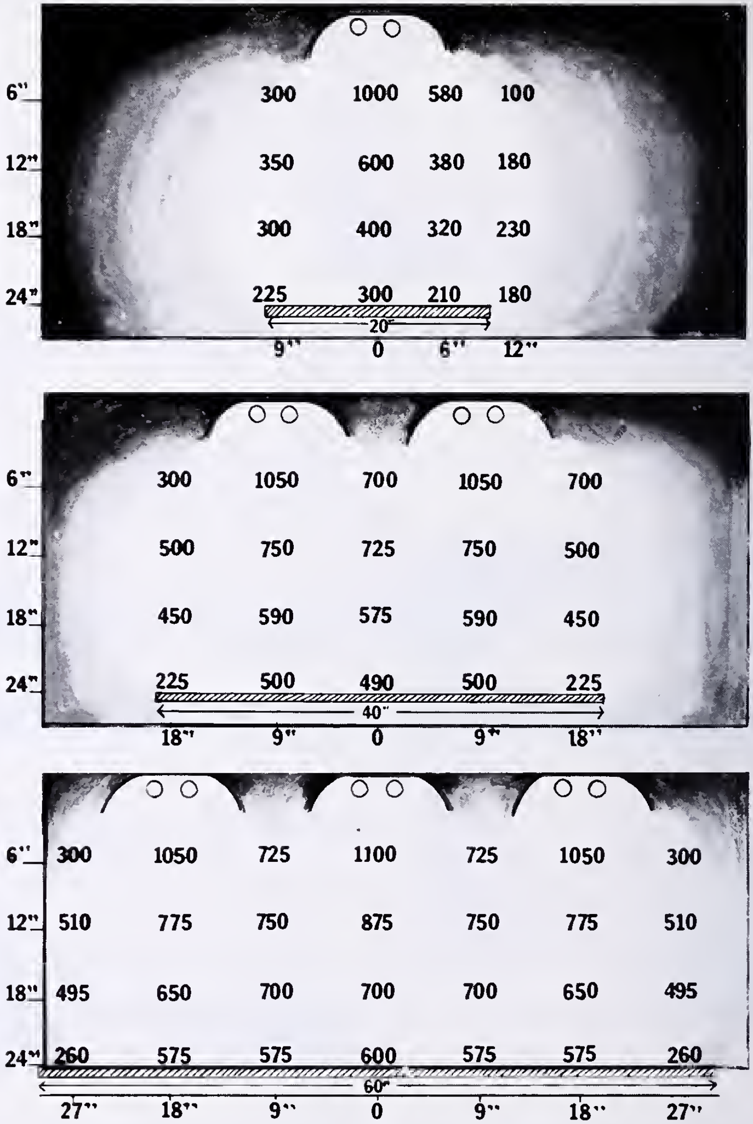
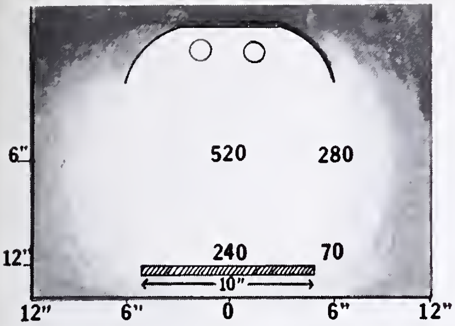


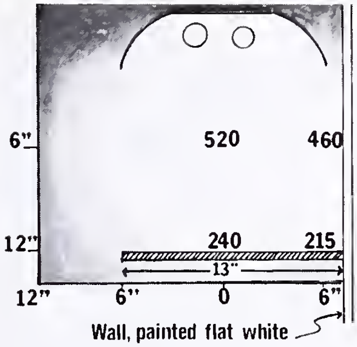
Fig. 10. Comparison of the compounding effect. Light distribution under central area of two 75-watt reflector fixtures mounted side by side on 18″ centers.

the compounding effect of multiple fixtures.

Uniform intensity of light can be achieved anywhere in an eight foot square garden, even at distances of eight feet, under six two-lamp 75-watt reflector fixtures mounted on 14″ centers.

Greater light intensity can be obtained by using four 75-watt lamp fixtures (Fig. 8). Almost the same amount of light can be obtained more efficiently with less energy by using a fixture with





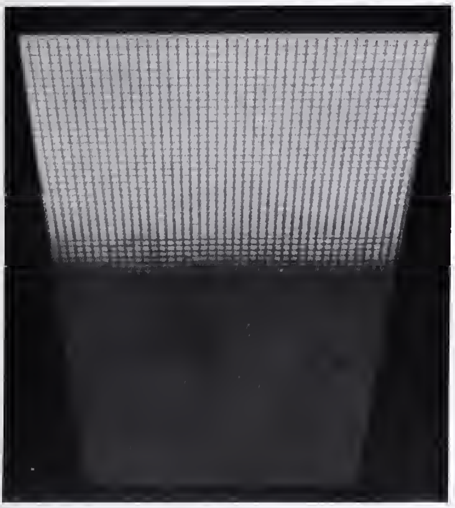


Fig. 11. (Above). Compounding effect from reflecting wall. Light distribution under central area of two 20-watt reflector fixtures.

Fig. 12 (Left). Para-Wedge Louver blocks glare, reflects light downward.

two 110-watt high-output lamps (Fig. 7).

Placing the light fixture near a reflecting wall is almost like adding another fixture to compound the light intensity in the garden (Fig. 11). Mirrors are excellent reflectors and also enhance the garden by giving it greater depth.

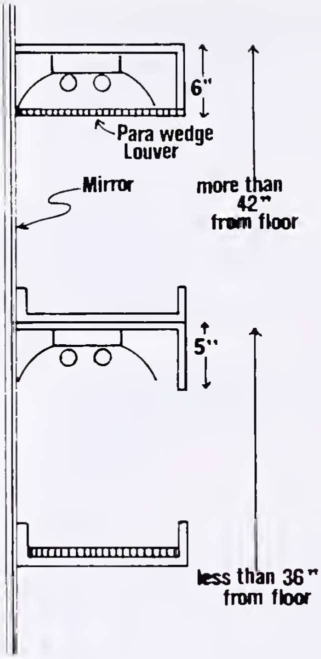
Light Shields

In a show garden, the lamps should not be visible. Use a valance to hide the light fixture. For fixtures mounted 36″ from the floor, the valance should extend ½″ below the lamp. For fixtures mounted 48″ from the floor, it should be 1″ below the lamps.

If a mirror is used behind the fixture, however, the lamp will be visible in the mirror. Therefore, for fixtures more than 42″ from the floor, a Para-Wedge louvre should be mounted 1″ below the lamps. These louvres have ½″ square cells with parabolic-shaped sides that reflect the light downward. When viewed from the front, the lamp and its glare are completely hidden (Fig. 12).

A standard commercial strip fixture is almost 4″ high. Using a ½″-thick mounting shelf, the required minimum valance has to be 5″ high at lower heights, and at the upper levels with the Para-Wedge louvre, the valance is 6″ high. In many rooms, when this is combined with a tray used to hide the plant pots, the appearance is rather bulky (Fig. 13).

The height of the valance can be reduced by at least 1½″ by taking the fixture apart and using only the cover; the housing is discarded and the ballast is mounted in the back, or side, away from the lamps. Since almost two-thirds of the



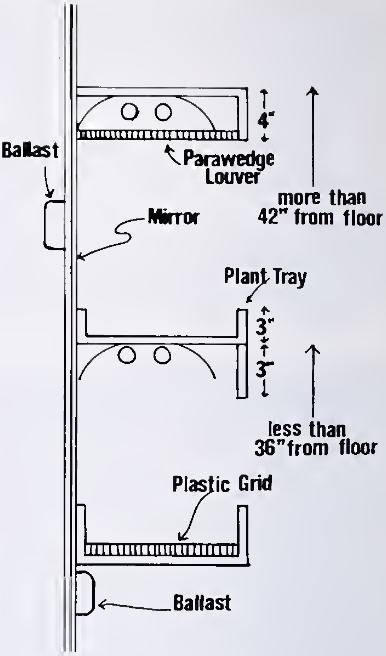
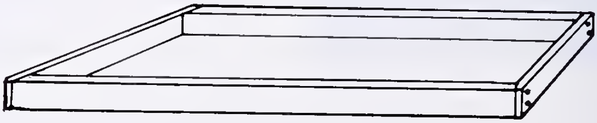


Fig. 13. (Above left). Light shielding valances with standard fixtures.
Fig. 14. (Above right). Light shielding valances, ballast removed and mounted remotely.
Fig. 15. (Below). Simple plant tray.



heat of a fixture is produced by the ballast, this also serves to reduce the heat near the plants (Fig. 14).

Plant Trays and Other Accessories

Waterproof trays of any size or shape to fit your light garden can be made from exterior plywood (Fig. 15). Use ½"-thick exterior type plywood, or for trays larger than 24"×48", use 3/4"-thick plywood. With waterproof glue for all joints, assemble the frame with No. 6×1½"-long F. H. brass screws and then attach the bottom with screws on 6" centers. Allow glue to dry, then sand smooth. Waterproof tray by coating it both inside and out with polyester resin (Pettit No. 13150 or equivalent). Lightly sand exterior and paint to blend with surroundings.

For good drainage, place pots on plain "egg-crate" plastic grids cut to fit trays. Water remaining in these grids at the bottom of the trays increases the humidity around the plants.

Landscaped gardens can be made by planting directly in trays terraced with soil mix and rock.

Automatic timers that turn the lights on and off are necessary for the consistent regulation of the length of the light periods. To dissipate heat in confined areas and for those plants that need circulating air, use the small slow-speed whisper-type fans. Room humidifiers are beneficial for most plants. ❧

TROUBLESHOOTING FLUORESCENT LAMP SYSTEMS

James A. Buck

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Fluorescent lamps are highly reliable in their operation. However, they have certain unusual characteristics which may be observed, or they may fail to operate from time to time. Therefore, the following possible problems have been assembled so that the indoor light gardener may better understand his fluorescent lighting system.

The largest percentage of lighting ballasts used today are the two-lamp rapid start type. But since there are still pre-heat circuit ballasts that use a starter, these circuits will be included. (Information pertaining to pre-heat circuits is rated *.)

NORMAL END OF LIFE

Possible Causes	**Corrective Maintenance**
1) Normal failure; active material on cathodes exhausted.	1) Replace lamp promptly.

SHORT LIFE

1) Wrong lamp type used.	1) Replace with lamp type marked on ballast label.
2) Wrong type of starter or defective starter causing on-off blinking or prolonged flashing at each start.*	2) Replace with proper starter.
3) Ballast installed not supplying the specified electrical values.	3) Replace with ballast of correct rating for lamp size.
4) Wrong type of ballast used; wrong voltage rating, instant start ballast in rapid-start fixture, etc.	4) Replace ballast with proper type.
5) Poor circuit contact (likely at lampholder).	5) Lampholder should be rigidly mounted and lamp securely seated. Bipin lamp must, in most cases, be turned 90° to seat all four pins.
6) Ballast improperly or incompletely connected.	6) Study ballast label wiring instructions and check connections.
7) Too many lamp starts.	7) Average life for most lamps is dependent on number of starts and hours of operation.

END BLACKENING

1) Normal end of life.	1) Replace lamp promptly.
2) Mercury deposits, generally within 1" of lamp end.	2) Should evaporate as lamp is operated.
3) Poor circuit contact (likely at lampholder).	3) Lampholder should be rigidly mounted and lamp securely seated. Bipin lamp must, in most cases, be turned 90° to seat all four pins.
4) Ballast improperly or incompletely connected.	4) Study ballast label wiring instructions and check connections.
5) Wrong type of lamp.	5) Replace with lamp type marked on ballast label.
6) No cathode heat (rapid start circuits).	6) Absent of cathode, heat may be caused by ballast failure, break in cathode heat circuit or improperly seated lamp.

7) Wrong type of starter or defective starter, causing on-off blinking or prolonged flashing at each start.*	7) Replace with proper starter.
8) Ballast installed not supplying the specified electrical values.	8) Replace ballast of correct rating for lamp size.
9) Line voltage too low or too high.	9) Check line voltage with range specified on ballast nameplate.
10) Ballast improperly or incompletely connected.	10) Study ballast label wiring instructions and check connections.

NO STARTING EFFORT OR SLOW STARTING

1) Open lamp cathode circuits due to broken cathode, air leak, or open weld.	1) Replace lamp.
2) No cathode heat. (Rapid start circuits.)	2) The absence of cathode heat may be caused by ballast failure, break in cathode heat circuit, or improperly seated lamp.
3) Dirt accumulation on 40-watt rapid start lamps subject to high humidity conditions.	3) Cleaning lamps with water restores normal ease of starting.
4) Wrong lamp type.	4) Replace with lamp type marked on ballast label.
5) Starter at end of life.*	5) Replace starter.
6) Starter sluggish.*	6) Replace starter.
7) Ballast installed not supplying the specified electrical values.	7) Replace with ballast of correct rating for lamp size.
8) Low temperature (starting difficulty may be experienced below 50°F).	8) Use a ballast designed for minimum expected temperature.
9) Low circuit voltage.	9) Check voltage and correct if possible.

DECREASED LIGHT OUTPUT

1) Low temperature operation. (Below 65°F light loss may be 2% or more per degree F.)	1) Change to enclosed fixture properly designed for expected temperature range.
2) Cold drafts or winds hitting lamp.	2) Enclose or protect lamp.
3) Where heat is confined around lamp, light loss is 1% per 2°F.	3) Improve ventilation of fixture.
4) Low circuit voltage.	4) Check voltage and correct if possible.
5) Ballast improperly or incompletely connected.	5) Study ballast label wiring instructions and check connections.
6) Dust or dirt on lamp or fixture.	6) Clean.

BLINKING ON AND OFF

1) Normal failure; active material on cathodes exhausted.	1) Replace lamp promptly.
2) Possible lamp fault.	2) Replace lamp. Investigate further if successive lamps blink or flicker in same lampholder.
3) Wrong type of starter or defective starter causing on-off blinking or prolonged flashing at each start.*	3) Replace with proper starter.
4) Ballast installed not supplying the specified electrical values.	4) Replace with ballast of correct rating for lamp size.
5) Low temperature. (Starting difficulty may be experienced below 50°F.)	5) Use ballast designed for minimum expected temperature. Enclose fixture.
6) Cold drafts or winds hitting lamp.	6) Enclose or protect lamp.
7) Low circuit voltage.	7) Check voltage and correct if possible.
8) Loose circuit contact (likely at lampholder).	8) Lampholder should be rapidly mounted and lamp securely seated. Bipin lamp must, in most cases, be turned 90° to seat all four pins.

RINGS

1) Brownish rings may occur at one or both ends on some lamps during life.	1) Has no effect on lamp performance.

DENSE SPOTS

1) Black areas may occur half way around tube near end of life on some lamps.	1) Has no effect on lamp performance.

COLOR DIFFERENCES

1) Wrong lamp used; possible lamp outside limits of color standards; or apparent color differences may be only difference in brightness between old and new lamp.	1) Replace lamps if objectionable.
2) Cold drafts or winds hitting lamp.	2) Enclose or protect lamp.
3) May be due to reflector finish, wall finish, other nearby light, room decorations, etc.	3) Interchange lamps before assuming color differences.

DARK STREAKS

1) Streaks lengthwise on tube or globules of mercury on lower (cooler) part.	1) Rotate tube 180°. Mercury may evaporate by increased warmth, though it may condense again on cool side.

END ONLY LIGHTED

1) Starter failure.*	1) Replace starter.
2) In new installation, may be wiring or ground fault.	2) Check circuit wiring.
3) Ballast improperly or incompletely connected.	3) Study ballast label wiring instructions and check connections.

OVERHEATED BALLASTS

1) Wrong lamp type.	1) Replace with lamp type marked on ballast label.
2) Wrong type of ballast used. Wrong voltage rating; instant start ballast in Rapid Start fixture, etc.	2) Replace ballast with proper type.
3) Short in ballast or capacitor.	3) Replace ballast.
4) Prolonged blinking tends to heat ballasts and heating is aggravated under high ambient temperature inside fixture housing.	4) See "Blinking On and Off" section.
5) High circuit voltage.	5) Check voltage and correct if possible.
6) Ballast improperly or incompletely connected.	6) Study ballast label wiring instructions and check connections.

RADIO INTERFERENCE

1) Lamp radiation "broadcasts" through radio receiver.	1) Locate aerial and radio at least 10 feet from lamp or shield aerial lead-in wire, provide good ground, and keep aerial out of lamp line radiation range.

NOISE

1) Slight transformer hum inherent in ballast equipment; varies in different ballasts. Objectionable amount may be due to improper installation or improper ballast design.	1) Tighten ballast bolts. Where possible use four bolts instead of two; tighten fixture louvers; glass side panels; wedge vibrating parts of fixture.
2) Overheated ballast.	2) See "Overheated Ballast" section.

LIGHT GARDENING SOCIETY

The Indoor Light Gardening Society of America, Inc., is an organization for plant enthusiasts who grow plants under artificial light. Several thousand members throughout the United States, Canada and some foreign countries exchange information through *Light Garden,* the Society journal, published five times each year. Many members share ideas and expertise directly with membership in a chapter or through a round-robin letter exchange. The Society publishes cultural guides which are devoted to specific plant culture and light garden construction. A seed exchange makes available unusual seeds from members and other sources; 35mm slide programs are available for use by chapters and individuals. For further information write: Indoor Light Gardening Society of America, Membership Secretary, c/o The Horticultural Society of New York, 128 W. 58th St., New York, NY 10019. ❧

PLANT SOCIETIES

African Violet Society of America, Box 1326, Knoxville, TN 37901

American Begonia Society, Elizabeth Sayers, 369 Ridge Vista Ave., San Jose, CA 95127

American Bonsai Society, Lynn Alstadt, 1363 W. 6th St., Erie, PA 16505

American Fern Society, Dr. J.E. Skog, Department of Biology, George Mason University, Fairfax, VA 22030

American Gloxinia and Gesneriad Society, Jeanne Marlon, Box 312, Ayer, MA 01432

American Ivy Society, Elise Everhardt, 921 Rambling Dr., Baltimore, MD 21228

American Orchid Society, 84 Sherman St., Cambridge, MA 02140

Bromeliad Society, Box 41261, Los Angeles, CA 90041

Cactus and Succulent Society of America, Box 3010, Santa Barbara, CA 93105

Indoor Light Gardening Society of America, c/o Horticultural Society of New York, 128 W. 58th St., New York, NY 10019

International Geranium Society, William McKilligan, 6501 Yosemite Dr., Buena Park, CA 90620

Peperomia Society, Mrs. Betty Davenport, 2013 Rd. 44, Pasco, WA 99301

Terrarium Association, Robert C. Baur, 57 Wolfpit Ave., Norwalk, CT 06851

Also, indoor-plant growers should know of **Gesneriad Society International** and **Saintpaulia International.** They are independent organizations but share the same bimonthly magazine, *GSN* (Indoor Gardener Publishing Co., 1800-02 Grand Ave., Box 549, Knoxville, TN 37901).

Fran Finkbeiner

Staghorn ferm *(Platycerium bifurcatum)* mounted on an elm tree in Mrs. Finkbeiner's light garden. (See p. 35)

Eva Melady

AN INVITATION TO JOIN AND ENJOY

> **A man does not plant a tree for himself;**
> **he plants it for posterity.**
> **—Alexander Smith**

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are $15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to PLANTS & GARDENS, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

....cut off here..

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BROOKLYN BOTANIC GARDEN (A Membership Society)
1000 Washington Avenue, Brooklyn, N.Y. 11225

I would like to become a member of the Brooklyn Botanic Garden.

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Patron, $500

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BROOKLYN BOTANIC GARDEN RECORD / PLANTS & GARDENS
Vol 36 No 4 Winter 1980-81

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BROOKLYN BOTANIC GARDEN RECORD
PLANTS & GARDENS

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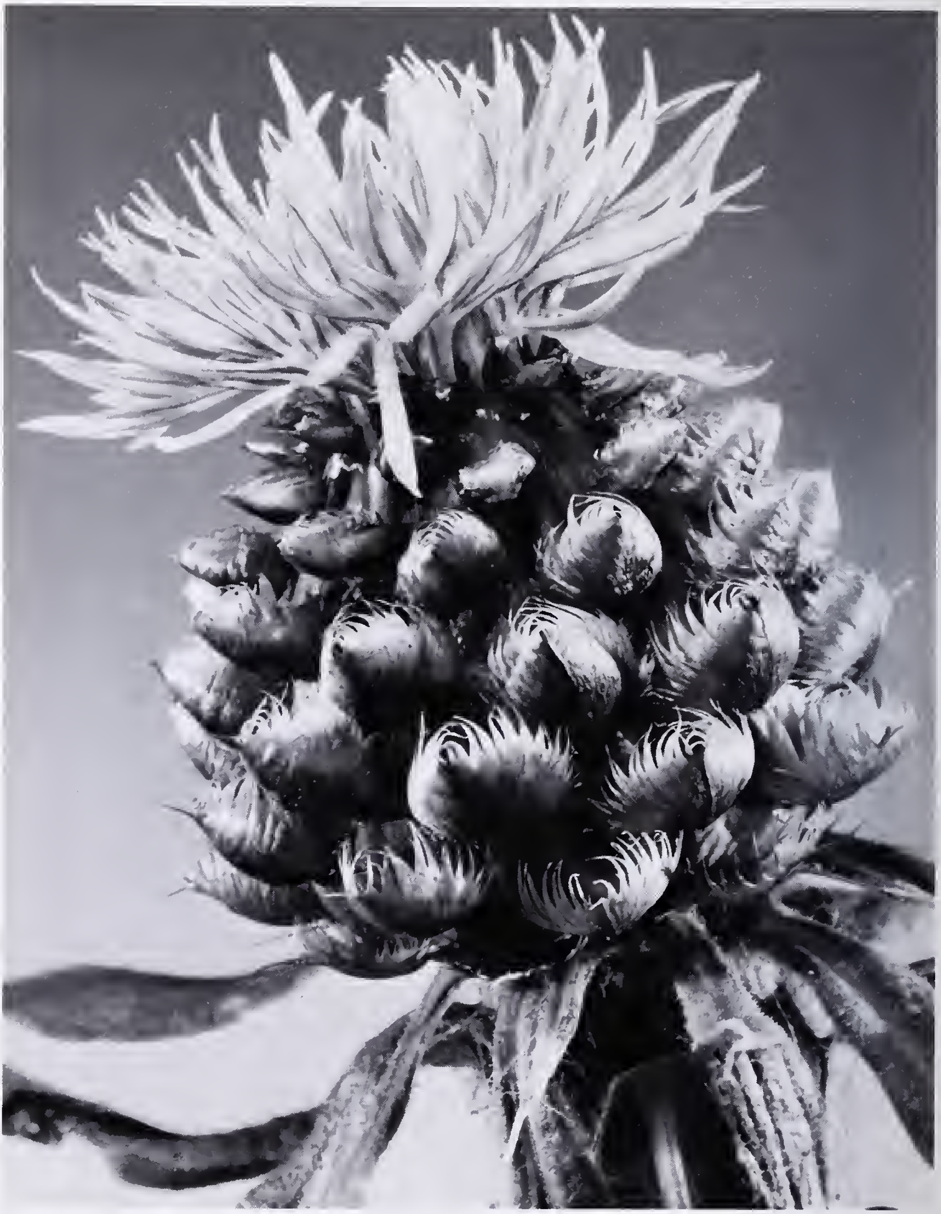

Roche

Yellow thistle (*Centaurea macrocephala*) is a striking Old World perennial with flowers that remind one of small pineapples, the symbol of hospitality. They are used mainly in dried floral arrangements, but are also attractive in the background of a garden in early summer. Plants grow four feet tall, require sun and benefit from light staking in windy areas.

LETTER FROM THE BROOKLYN BOTANIC GARDEN

One gardening year of the 1980's has passed and a new one is already upon us. As most readers know, the Winter *Plants & Gardens* departs from the single-subject Handbook format to present a series of articles of broad appeal, mostly reprints of pieces of more-than-routine interest which appeared originally in sister publications in the previous year. Let us thank both contributors and periodicals who have made possible this 148th issue from the Botanic Garden.

The beginning of a gardening year is time to take stock. Over winter it is easy to forget what went right, and what didn't, the previous year. Circumstances change, too. The vegetable garden, continuing to make a revival in part because of inflation, is a case in point. Even people who a few years ago grew only ornamental plants and scorned veggies are looking at radishes in a new light. That doesn't necessarily mean that one must grow vegetables in the traditional rectangular plots, which frequently appear as impositions on the landscape. A number of vegetables, including rhubarb chard, "flowering" kale and, yes, even okra, are ornamental in their own right and can do double duty in the border or in containers. (Some ornamentals, including daylilies and hostas, have edible parts.) True, there is always the problem of what to do with all the zucchini. (This year my spouse and I plan to plant just half a seed!)

Gardening is experiment, even for the advanced grower, and one of its joys is doing something a little different each year. It might be a matter of growing salsify or corn salad, neither of which can be bought in the supermarket, or developing a special garden interest, perhaps with a section of a border devoted to flowers used in dried arrangements in winter, or to scented flowers.

Single-color borders stimulate the imagination of some growers. The best known is the all-white garden at Sissinghurst in England, but even more demanding—and not to everyone's taste—is an all-red border, as seen at Hidcote, also in England. If monochromes don't excite, the two-color border composed of, say, yellow and orange flowers may appeal. Such borders create moods, but another benefit is that we are induced to learn about certain groups of plants in depth and, therefore, gain a different perspective.

A visit to the Brooklyn Botanic Garden will provide a host of ideas for theme gardens. There are fifteen-or-so gardens in the overall framework. The Japanese, rose and herb gardens are the best known, but there is even a Shakespeare Garden and a border devoted largely to ornamental grasses, which are remarkably beautiful in autumn after the chrysanthemums fade. To use a phrase coined by C. Stuart Gager, BBG's first director, Brooklyn has "many gardens within a Garden." At any season come visit the garden for *all* seasons!

Good gardening in 1981!

Sincerely,

Frederick McGourty

Editor

All photos: National Herb Garden

The Knot Garden

The curator touches on some fascinating plants during . . .

A WALK THROUGH THE NATIONAL HERB GARDEN

Holly Harmar Shimizu

The National Herb Garden, located at the U.S. National Arboretum in Washington, D.C., aspires to be one of the great herb gardens of the world. A gift to the American people from the Herb Society of America, it contains hundreds of different useful plants. The dedication took place on June 12, 1980. Covering an area of more than two and one-half acres, it is thought to be the largest designed herb garden in the world. The brick entrance walkway lined with dwarf English boxwood *(Buxus sempervirens* var. *suffruticosa)* leads to the reception area where the visitor is greeted by a circular pool and fountain. Beyond the fountain is the curved granite balustrade overlooking the contemporary knot garden. After viewing the knot, the visitor is directed to the Historic Rose Garden, where approximately one hundred of the most outstanding old roses (those grown before development of the hybrid tea in 1867) are thriving.

From the Rose Garden the visitor is led into the largest section of the garden, an oval area containing ten specialty gardens. Each one contains a collection of herbs relating to a particular topic. These are: Dioscorides, Dye, Early American, American Indian, Plants in Medicine, Culinary, Industrial, Fragrance, Oriental and Beverage. The gardens are sloped to facilitate drainage and to enhance the visibility of the plants. Dwarf English boxwood is used to separate each of the specialty gardens. On a quick walk through the specialty gardens, I will describe a plant from each that is of special interest.

Dioscorides, Dye and Early American Gardens

The first garden is that of plants known to Dioscorides. As a Greek physician in the first century A.D., Dioscorides studied and wrote of the medicinal uses and effects of more than six hundred plants. His book, *De Materia Medica,* was the supreme authority on medical botany for over fifteen hundred years. Many of the plants he mentioned are still used today in modern medicine. For example, the root of ginger *(Zingiber officinale),* a plant which is thriving in this garden, has long been employed in different parts of the world as a medicine. Taken as a tea or tincture, it aids in cleansing the system and easing the effects of the common cold. It is often an ingredient in combination with other medicines. Ginger root is available in many forms including fresh, dried, powdered and oil. The best ginger root is said to come from the West Indies. Although many medicinal plants are being grown at the National Herb Garden, it should be stressed that remedies or concoctions are *never* recommended. Self-medication should only be under the supervision of a physician.

Ginger is a tender perennial generally cultivated in tropical areas. Its creeping roots are thick, tuberous rhizomes, often white or buff colored. The numerous stems which shoot up in spring have narrow, lanceolate leaves which are quite attractive in their own right. Even though ginger is easily cultivated, it is not common in herb gardens. It requires a rich, well-drained soil and should be dug up, divided and taken indoors for the winter except in the mildest parts of the country where it can live over outdoors.

Of interest, as we move along into the Dye Garden, is madder *(Rubia tinctoria),* a plant so important to dyers and calico-printers in the nineteenth century that their businesses could not exist without it. The root of madder produced a staple red dye for wool, silk and cotton until the latter part of the nineteenth century when its main constituent, alizarin, was synthesized. Various mordants (fixatives) will produce different colors: red, pink, lavender, brown, orange and black. Used in combination with other dyes, it gives compound colors. To get maximum color from the root, the dye-bath must be heated very gradually, taking about one hour to reach the boiling point.

Madder grows best in a well-drained, slightly basic soil in full sun or partial

The Culinary Garden where many familiar as well as unusual herbs for cooking and food preparation are grown and displayed.

Costmary (*Chrysanthemum balsamita*) from the Early American Garden. Under the name Bibleleaf, its leaves were chewed to keep the sleepy church-goer awake.

shade. The long stalks of whorled, spiny leaves usually creep along the ground and root as the stem falls.

A plant worthy of special attention in the Early American Garden is known, depending on how it was used, as Bibleleaf, alecost or costmary *(Chrysanthemum balsamita)*. The name "alecost" stems from its use as a flavoring agent for ale in the middle ages and "Bibleleaf" from colonial times when it was taken to church as a marker for the Bible. In church, its leaves were chewed during long sermons since it was supposed to keep the listener awake. The "Mary" in the name costmary refers to the Virgin Mary, a medieval association. Most likely, plants of costmary were carried from Europe to England and eventually to America.

Today, costmary leaves are still highly regarded for their sweet fragrance and flavor. They are excellent as a tea, flavoring in soups and cakes, and in potpourri. The yellow, button-like flowers that appear in autumn dry well and are used to decorate herbal wreaths. Costmary is a perennial, best grown from root divisions in spring or autumn. It will grow in partial shade or sun and prefers a well-drained soil.

Indian Plants, Medicinals

Many of the early American herbs are exotics. Others were useful native plants that soon became a part of colonial life. Frequently, the American Indians were responsible for teaching settlers how to use native plants as medicine, dye, food, flavoring and for making fiber.

In the next specialty garden, one devoted to American Indian plants, American pennyroyal *(Hedeoma pulegioides)* is an example of a native plant once highly regarded for its usefulness and now just returning to cultivation. It is a small annual herb growing in almost all types of conditions and offers aromatic blue flowers from July through September. The Indians rubbed leaves of American pennyroyal on their skin to repel gnats, ticks, fleas and mosquitoes. They also believed that this plant would take away pain from any limb to which it was applied and that as a tea it was effective against headaches and itching eyes. Pennyroyal or "squaw mint" was introduced to the settlers by the Indians. It then became important in the medical profession for its properties as a stimulant, carminative and emmenagogue, but is no longer used as such.

Following the specialty gardens in sequence, the Plants in Medicine Garden contains a variety of important modern medical plants. A plant with a geat success story is rauvolfia *(Rauvolfia serpintina)*, a climbing shrub native to India and nearby countries. In the 1950's *Rauvolfia* became known as the first tranquilizer in Western medicine. Two Indian physicians isolated alkaloids from this plant and tested patients with the powdered root and found that it gave relief from high blood pressure, insomnia and certain mental disorders. A pharmaceutical company in 1952 marketed the most effective alkaloid from the root, reserpine. Then, with further testing and widespread use, reserpine became a new drug treatment for mental illness. Since then more reserpine-like compounds, both natural and synthetic, have been found and are now widely prescribed. Plant medicine, with all its ancient history, holds possibilities in the future for solutions to many of our modern medical problems.

Culinary, Industrial Plant Gardens

Moving on to the culinary garden, which no doubt has the most familiar herbs, we find a clump of salad burnet *(Poterium sanguisorba)*, an attractive low-growing, semi-evergreen perennial. The tender young leaves have a flavor like cucumber and are a delicious green in salads. Pinching off flower buds will encourage more leaf growth. Flowers and leaves add their flavor to vinegars, dressings, cream cheese, drinks, butters and as a garnish. Plants protected for the winter in a coldframe can provide greens throughout the year.

Salad burnet, originally from the Mediterranean region, became naturalized in Europe and Asia and then found its way to America with the early settlers. Suggestions for cultivation include sun for the better part of the day and well-drained soil which is not unduly acid. Ranking high among the decorative herbs, salad burnet is worthy of a space in even the smallest herb gardens.

Progressing, let us walk to the next specialty garden, one given to Industrial Plants. Here we find jojoba (pronounced ho-ho-ba) *(Simmondsia chinensis)*, a member of the Boxwood Family which is of particular interest because its seed

Salad burnet (*Poterium sanguisorba*), a handsome semi-evergreen perennial, lends a cucumberlike flavor to salads.

produces a replacement for sperm-whale oil. Sperm-whale oil, taken from the mammal's skull as well as from its blubber, is invaluable to industry. The jojoba bean oil fulfills every requirement in industry for the sperm-whale oil and has none of its disadvantages. It has no fishy smell, is not derived from an endangered species, and is easy to produce, the plant having a life span of about two hundred years. These oils are valuable because of their constant viscosity under extreme temperature changes, making them ideal for use in high speed machinery lubrication, transmission fluids and as a stabilizer for volatile oils. Whale oil had become an important ingredient in the manufacture of cosmetics, pharmaceutical products, polishes, candles and carbon paper until its use for these purposes was banned in the United States in 1972. At this point, there is not enough jojoba oil available, but the trial plantations in Arizona and California are a good start toward providing the world with a superior alternative to sperm-whale oil.

Jojoba is an evergreen, dioecious shrub native to the dry, frost-free desert areas of the southwestern United States and northern Mexico. It prefers well-drained, well-aerated soils that are slightly basic. The plant cannot be grown outdoors in the colder parts of the country. Jojoba can be propagated easily from seeds or cuttings. Plants will start producing seeds in about five years.

Fragrant, Oriental and Beverage Gardens

Into the Fragrant Garden, clary sage *(Salvia sclarea),* will be recognized immediately as a highly desirable and ornamental herb. This aromatic biennial is grown commercially for the leaves and flowers which yield an essential oil used in perfumery and in flavorings. The lovely odor of this oil combines well with other herbs such as lavender, bergamot or jasmine. In flavorings it is added to wine and beer, and as a food ingredient to clary sage fritters.

The beautiful furry heart-shaped leaves of clary sage are topped with tall, showy, white and blue fragrant blossoms. It needs to be in the background of the garden because in its second year it attains a height up to four feet. Seeds may be sown in place in autumn and should germinate within a week. In nature, clary sage grows in high places on dry, calcareous soils with intense sunshine and little rain. These conditions result in the highest grade and yield of essential oil.

A herb with much interest in the Oriental Garden is the tawny daylily *(Hemerocallis fulva).* Its delectable flower buds are grown in the Orient as a cash crop. Farmers pick the buds just as

An overview of the Specialty Gardens

With fuzzy leaves reminiscent of lamb's-ears (another member of the Mint Family) clary sage *(Salvia sclarea)* is a useful as well as a handsome biennial.

the flowers begin to open, Immediately afterwards they are steamed, spread on a mat, and dried in the sun. Collectors take the daylily buds to wholesale merchants for shipment to larger cities in bamboo baskets weighing three to four hundred pounds. If for world trade, the dried buds are taken to Hong Kong and put into small packages.

Daylily buds are included in the finest of Oriental dishes. They contain vitamins and minerals and are high in protein. If buds are used fresh, the stamens, pistil and receptacle are removed. If dried, the material should be soaked overnight and then those parts removed.

Tawny daylily is a summer-flowering herbaceous perennial forming clumps of arching strap-shaped leaves. It is naturalized along roadsides in many part of the United States, and the ornamental orange flowers with tinges of red are known to most gardeners.

Let us proceed to the Beverage Garden. In the background is lovage *(Levisticum officinale)*. It is one of the giants of the herb world, sometimes reaching six feet in height. The huge compound umbels of greenish-yellow flowers sway in the wind on top of the fleshy stalks. The large green leaves resemble celery both in appearance and flavor. Lovage leaf stalk and stem are blanched and used like celery to make a fragrant tea while the fruit is used to produce a delicious cordial.

Culpeper writes that one plant of lovage will be more than enough for a family. It is a hardy perennial preferring a sunny location with a rich, moist soil. Lovage seed must be sown as soon as it ripens because its viability is low. Otherwise root divisions may be taken in spring.

Our quick walk through the specialty gardens is completed, but I have only touched on a few of the fascinating plants in the National Herb Garden. Finally, our country has a national showplace for herbs where hundreds of plants are grown for research and education. This garden, designed by Tom Wirth of Sasaki Associates, has something for everyone. It is a special resource for scientists, doctors, students, craftsmen, growers and, in fact, all who are interested in herbs. The best time of year to see the garden is from June through September. When you next come to Washington, please make a point of visiting the National Herb Garden. ☘

Repeated defoliation can harm or kill trees . . .

CAN TREES SURVIVE THE GYPSY MOTH?

Craig R. Hibben

From public meetings and some newspaper coverage of the gypsy moth problem, an impression has evolved that an infestation by the caterpillars is primarily an esthetic nuisance, and the effects of defoliation are transient and inconsequential. Years of experience with this pest in the northeastern states, where the outbreaks have been most severe, plus new research by scientists of the U.S. Forest Service, have shown that defoliation by gypsy moth caterpillars, in fact, can be harmful to trees.

The evidence of abundant new egg masses indicates that the caterpillars will return in the spring of 1981, so once again homeowners and municipalities will face difficult decisions on how to deal with this pest. The following points are presented to summarize and clarify the immediate and long-range impact of defoliation on trees, so that decisions can be based on a full understanding of the consequences of a severe gypsy moth infestation. This is followed by recommendations on how best to cope with defoliation by the gypsy moth.

1. This insect can inflict impressive tree losses. One survey by the Pennsylvania Bureau of Forestry showed that from repeated defoliation in the forest lands of twenty counties during 1971-78, 412.9 million board feet of sawtimber and 408.3 million cubic feet of pulpwood were lost. The combined monetary loss was calculated at $26,900,000. Figures for losses of individual community or homeowner trees are not available. Estimates would have to include the substantial costs of removal of dead trees and their replacement, as well as the reduction in property value following the removal or disfigurement of valuable trees.

2. Oaks *(Quercus)* are the preferred hosts of the gypsy moth, and most losses are to this genus. During severe and prolonged infestations, however, numerous additional trees are attacked—apple, beech, birches, maples, willow, even pines and other evergreens. Among the few species that are unpalatable to the caterpillars are black and honey locusts, black walnut, catalpa, flowering dogwood, white ash, and tulip-tree.

3. When does defoliation become harmful to trees? Healthy trees that are partially defoliated once, so that up to about fifty percent of the foliage is lost, are not seriously affected. Consumption of fifty to seventy-five percent of the foliage often, and over seventy-five percent almost always, results in refoliation of the tree the same year. That is, new leaves develop from buds which normally remain dormant until the following spring.

Healthy trees in good sites have a remarkable recuperative capacity and frequently can withstand a single defoliation-refoliation incident without lasting harm. Pines and other evergreens, however, often die following even a single heavy loss of needles.

As we face another infestation in 1981, it is important to realize that trees begin to suffer after two or more succesive years of defoliation. This happens when the gypsy moth lingers in an area for two or three years before a collapse of the population. Loss of leaves two years in a row, particularly if extensive enough to cause complete refoliation both times, is likely to result in significant branch dieback and sometimes tree mortality. Even moderate defoliation, not severe enough to cause refoliation, can be detri-

Photos by Joseph Savage

Gypsy moth caterpillars attack both deciduous and evergreen trees. Originally from Europe, they have few natural enemies in North America.

mental to trees if repeated for two or more years.

4. Trees are especially vulnerable to attack by gypsy moth caterpillars because leaf injury begins in the spring just four to six weeks after buds expand into shoots and young leaves. This period happens to coincide with the stage when stored foods in the roots, trunk and branches have reached their lowest level and they are inadequate to maintain tree vigor until new food-producing leaves are grown. Sugars and other reserve foods are depleted still further if a second crop of

The rather nondescript gypsy moth lays eggs that appear wrapped in scorched cotton wool.

leaves is produced the same year. Refoliated trees often have leaves that are a lighter green because of reduced chlorophyll, the substance that converts sun energy to sugars for tree growth. Matured new leaves may be smaller than normal and fewer in number than before defoliation. Although more important to the commercial forester than to the homeowner, lessened shoot growth and radial expansion in the wood are additional effects of defoliation.

5. Trees with critically reduced food reserves are jeopardized for several reasons. The tiny feeder roots that take in water and mineral nutrients begin to die. Trees going into the winter resting period with depleted sugars become susceptible to winter-kill of buds, small twigs and branches.

Defoliated trees become weakened or predisposed to injury by additional climatic and biological stresses. Notable stresses are extended dry periods, exposure to air pollutants, attack by other insect defoliators and borers, and invasion of living bark and roots by so-called opportunistic fungi, *i.e.*, fungi that infect only weakened trees. Recent research has shown that the physiological process of bark wound healing and callusing is slowed after the loss of leaves.

There is great variability among trees in their rate and extent of recovery after defoliation incidents. This depends on tree health both preceeding and following insect attack. Also, trees can show a delayed reaction to defoliation that is generally not recognized. For a year or two they may appear to have recovered from an episode of leaf destruction, but later, trees show a general lack of vigor and they develop gradual twig and branch dieback symptoms for no apparent reason.

How to Cope

Despite the concern by some over the advisability and safety of applying insecticides, the protection of foliage by spraying is recommended as the most effective control measure for the gypsy moth that is available to us today (although caterpillars can be hand-picked off small trees). Sevin and methoxychlor, both of which are low-hazard and effective insecticides if they are used according to directions, are recommended by Cornell University (1980 Commercial Tree and Shrub Insect Control Recommendations for New York State) for the control of caterpillars feeding on foliage. Although less effective on the newly-hatched caterpillars, the bacterial insecticide *Bacillus thuringiensis* is available for those opposed to the use of chemical pesticides. None of the three pesticides is prohibited from being used by either the Environmental Protection Agency or the New York State Department of Environmental Conservation.

There are methods to reduce defoliation without the use of pesticides. The entrapment of caterpillars by sticky bands on tree trunks (not recommended for thin-barked trees like maples and young oaks), the use of burlap skirts on tree trunks to collect migrating caterpillars, and the destruction of egg masses are helpful during light infestations. These methods usually fall short of protecting trees when caterpillar populations are extremely high, as in 1980. The introduction of parasites and predators, the use of a nuclear polyhedrosis virus which infects and kills caterpillars and the dispersal of a pheromone which attracts male moths all show promise as exciting new methods for helping reduce populations of the gypsy moth.

Research continues on the immediate and delayed effects of attack by the gypsy moth, but enough has been learned so far to state with certainty that defoliation by this insect can be harmful to trees. Safe and effective control measures are available. Clearly, a thorough understanding and a balanced viewpoint of the full impact of this insect on our trees is essential before we can make wise decisions on how to deal with it. ✤

WHAT'S KILLING THE DOGWOODS?

Reprinted from GARDEN GUIDES,
Cooperative Extension, New York State, April 28, 1980

Spot anthracnose or petal blight on flowering dogwood *(Cornus florida)* was severe last year in many areas of Long Island. The fungus, *Elsinoe corni,* causes many small, dark-ringed spots on the flowering bracts and leaves. It is assumed that this disease, when severe, causes a certain amount of loss and vigor to the tree. This, coupled with weather extremes, other diseases (Botrytis, Botryosphaeria, etc.) and insects (borer), has raised havoc with our native dogwood, especially last year. If your dogwoods had a great deal of die-back last year, and you are suspicious of them this year, we advise spraying, when flower buds open to the cup stage, with mancozeb (Dithane M-45, Fore, or Manzate 200). Reapply at monthly intervals until next year's flower buds have formed in summer. ❧

Photos: Richard Weir

Above, Botrytis leafblight on dogwood causes dark, necrotic areas. Below, spot anthracnose begins on the bracts and spreads to the leaves as flowers and bracts fade.

Photos: Estelle Gerard

About New York . . .

THE LOVING TOILS OF A BROOKLYN ROSARIAN

William E. Farrell

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Each weekday morning at eight, Peter Malins arrives at his palace grounds, a fertile acre of New York City land that for two decades has responded to the genius of his hands

This particular morning—clear, crisp, brilliantly lit—Mr. Malins walks past 'Frau Karl Druschki', 'Amelia Graveraux', 'Queen Elizabeth', *Rosa alba* and 'Dr. Van Fleet', a fifty-three-year-old climber. All of them prosper in Mr. Malins's garden, along with about nine hundred other species of roses that bud and flower on five thousand bushes in the Brooklyn Botanic Garden, a municipal Versailles and one of the city's treasures.

Mr. Malins's domain, a small part of the BBG grounds, starts at a fountain where a statue of a sea nymph, surrounded by cattails and long-stemmed hybrid tea roses, sends forth a stream of water. It meanders through neat rows of

Peter Malins, Brooklyn Botanic Garden Rosarian, performs many tasks by hand, including pruning plants and cutting blooms.

rose bushes to a white, latticed gazebo that Mr. Malins calls a tea pavilion and ends thousands of blooms away near the parking lot shared by the Botanic Garden and the Brooklyn Museum.

Dressed in forest green work clothes, a pair of sharp clippers in his back pocket, Mr. Malins moves from bush to bush—snipping, pruning, checking top soil and caressing some of the many red, pink, peach, yellow and white roses still thriving in the nippy fall air.

Beauty and Reality

"This is so beautiful," he says, "and after a day's work it's gorgeous, the grounds of a palace." Out come the clippers. In seconds he lops off dead flowers and prunes back a bush.

"It's in the way you cut that you know if it's a shoemaker or somebody who knows roses," he says and adds a constantly repeated word that sounds like "zinyah." It is colloquial Latvian, the native of Riga says, and means "listen."

At a clump of *Rosa alba*, he points to what appear to be juicy berries. "Rose hips—they make wonderful Jell-O and flavor your tea," he explains. "Good on a cold day." Tightening the string holding a climber to a trellis, Mr. Malins says that last spring "was the richest—paradise this spring—but a bad summer, dry."

A visitor, lulled by the tranquility of the place, says how pristine his work life must be. The naïve observation is a cue, and Mr. Malins speaks of aphids, spider mites, borers, Japanese beetles, the maggoty rose midge, cankers, a bacterial pestilence known as crown gall and a disease called black spot.

"I got the dampness. Every gardener

gets it sooner or later," he says. "On wet days my feet get stiff." He holds out strong hands that look as if they were clawed by a kitten and says, "Roses after thirty-one years still scratch me, 'zinyah.' "

The point is made. None of this pastoral beauty dug out of the dirt in an urban setting just happens with the planting of seeds. "Once in Munich," he recalls, "I was a bookkeeper and you work four hours to look for three pennies and that's terrible. All the time I look at the watch. Here fourteen hours go by and I don't know."

The Man and the Roses

Mr. Malins—his title is 'rosarian' and he was recently honored by the American Rose Society at its national convention in Buffalo—walks to work from a Brooklyn apartment he and his wife share with a palm tree and a rhododendron. There isn't enough light for roses. He appears to be in his 60's, but he won't say because the thought of retirement is abhorrent to him. "I feel very young—I don't want people to think I'm old—I'm very strong," he says.

Rose growers write to Mr. Malins, and some of the letters read like distraught parents writing a pediatrician about their children's ailments. "Roseholics they are—so warm and nice," he says. "You know, once I was at a rose convention in Oxford, England, with the lords and ladies. They love roses. Really love them. Here machines are the big deal, but horticulture we're just learning."

He walks past 'Eiffel Tower' hybrid tea roses which grow to a height of eight or nine feet. "The ideal rose has sixty to sixty-five petals," he says, "and to create such a rose can take eight to ten years."

He passes a hybrid rose bush named for him. He did the grafting and created the delicate flower over an eight-year period. Then a stop at 'Tropicana,' an elegant orange-red that is his favorite. A pause at the 'John Kennedy' rose, "Beautiful for the greenhouse, but the plant is weak for outdoors."

The rose garden is empty this weekday morning, except for a dark-haired high school girl working on a term paper. It's easy to start a fantasy about roving the grounds of one's estate. "This place is like a library with good books and bad books," Mr. Malins says. "We have weak roses and strong."

He points to a bed of dark red 'Oklahoma' rose bushes, which are kept up by a grant from the widow of a doctor who often came to help him. "Doctors and priests come here to clear the mind," he says.

It's time for a pause. The Botanic Garden's coffee break is one of the nicest in the city. Gardeners from all over the grounds gather around long tables in a locker room. Strong coffee and tea are poured into mugs. The gardeners take turns providing eats.

Today there are peanut butter cookies and store-bought coffee cake. A young woman, wearing the same green uniform Mr. Malins wears, says there's something wrong with the hemlocks near the Fragrance Garden, an enclave for the blind with signs in Braille, and heavily scented flowers and herbs planted at waist level so they can be touched and smelled. The gardeners agreed to replant the hemlocks.

Afterward, Mr. Malins escorts a visitor to the main entrance and gives him a 'Queen Elizabeth' rose as a souvenir.

"We must cultivate our garden," Voltaire wrote. In Brooklyn, "zinyah," there is a man doing just that for many of us. ☙

SOIL

A handful of soil may contain as many organisms as there are people in the world.

—*The Dawes Arboretum Newsletter*

THE FORTUNES OF ROBERT FORTUNE

The year 1980 was the hundredth anniversary of the death of Scottish plant explorer Robert Fortune. Although he wrote several books about his sometimes hair-raising travels in the Orient, Fortune is not as familiar a figure as some of the more flamboyant collectors sent out from Great Britain in the last century, perhaps in part because his private papers were burned by a tidy descendant. Strange, for he introduced tea plants to India from China.

The ornamental plants Fortune brought home to Britain in Wardian cases (terrariums) form an impressive list, since he was one of the first Westerners to visit China (1843-46) after the Opium War, and Japan (1860-61) after it was opened to foreign trade. Two which bear his name are *Euonymus fortunei* and *Rhododendron fortunei*. The former is a surprisingly variable semi-evergreen-to-evergreen species, sometimes a vine, sometimes a shrub, which has given rise to a number of cultivars, including the popular Emerald series. The latter has proved to be one of the most valuable rhododendrons for breeding, the Dexter hybrids (including the lovely pink-flowered 'Scintillation') and Loder rhododendrons being prime examples.

Fortune is also associated with the introduction (actually re-introduction) in 1846 of one of the best loved of all hardy perennials—the old-fashioned Chinese bleeding heart (*Dicentra spectabilis*), seen on the front cover of this issue. At the time he was introducing plants from Japan to England, an American medical doctor, George Rogers Hall, was doing the same for his country. Both, for example, share credit for the goldband lily (*Lilium auratum*). For more information see Dorothy Rose's article on Robert Fortune in *The Garden (Journal of the Royal Horticultural Society)*, May, 1980, pp. 218-22. ❧

George Taloumis

Rhododendron fortunei 'Scintillation', an improved pink-flowered hybrid descendant of the plant brought from China by Fortune.

Drawings courtesy of White Flower Farm

For a change grow . . .

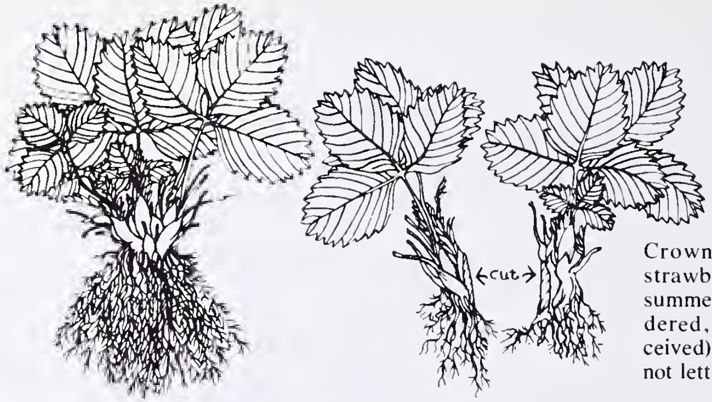
THE ALPINE STRAWBERRY— DELICACY FOR DINERS

Robert Estelle

Reprinted from MINNESOTA HORTICULTURIST, August-September, 1980

The Alpine strawberry is one of the most delightful of all plants to grow in containers. It is small and pretty, fitting neatly into a six-inch pot. The bright green leaves, the white flowers and the red fruit are held above the soil on thin, strong stems. The plant has a much more delicate appearance and is more erect than the commonly-grown garden strawberry which has runners and tends to sprawl. The Alpine strawberry has no runners and its fruits are held well above the plant, as if on display. Because it has such a tall, slender aristocratic appearance, it is hard to believe that the Alpine strawberry is extremely hardy, easy to grow, and—above all—delicious.

The Alpine strawberry varieties are cultivated forms of the wild European strawberry *Fragaria vesca* with the added denomination of *semperflorens* or *sempervivens*. The usual garden or commercial strawberries are hybrids, combining forms of the North American *Fragaria virginiana* and the South American *F. chiloensis*. The fruit of the Alpine strawberry is not as large as that of the hybrid commercial kinds familiar to most gardeners, but it is appreciably larger than the native wild strawberry, still to be



Crown division of Alpine strawberry is done in late summer (or, if plants are ordered, in spring when received). Plant as you divide, not letting the roots dry out.

found in Minnesota [and elsewhere] in wooded areas. The Alpine strawberry is considered to be extremely tasty and has acquired something of a reputation as a select fruit for gourmets.

Sowing and Growing

Alpine strawberries are rather easily grown from seed and are inexpensive when raised in that way. Some mail-order nurseries sell plants for a dollar or more each, but it is possible, with a little care, to get fifty or more plants from less than a dollar's worth of seeds. In March or April the seed should be sown by sprinkling on top of moist vermiculite. The seeding containers should be placed where they can receive light during the day, at a temperature of 55° to 70°F until the seeds germinate. The seeds are small and should not be covered. They sprout irregularly, taking from two to four weeks. One should be careful not to disturb the seeds by careless watering. As soon as the plants are large enough to handle, transplant them from vermiculite into soil in two-inch pots where they can remain until transferring them to six-inch pots in May or June. The young plants must not be allowed to freeze, of course, but they will grow well in cool temperatures. The soil should be well drained and there should be good air movement around the plants, but the soil must not be allowed to dry out completely between waterings.

Because the Alpine strawberry is a woodland plant, it can be grown successfully all summer in partial (but not deep) shade. If seeded in March, the plants should start producing berries in August, continuing until frost or, if protected, until November. The following year, if given some protection during the winter, they will begin bearing in June. In fact, the first berries were picked this year on June 7.

It is evidently not necessary to protect the plants from birds, who are often attracted to the ripening berries of the usual garden strawberries. Despite (or, perhaps, because of) the fact that the fruit are held on erect stems, above the leaves, they are not bothered. This is mentioned in British books which describe Alpine strawberries, and it seems to be borne out by experience here in Minnesota.

Division and Care

In late August or early September, each year, the crowns can be divided into two or three times that number of plants, each plant having developed a second or a third crown. The plants, because they do not send out runners, must be propagated vegetatively by division of the crowns. The danger in repeated vegetative propagation of Alpine strawberries lies in their possible susceptibility to virus infections from aphids. Alpine strawberries have not been bred for disease resistance and they may develop infections over a period of several years. Propagating new plants from seed every few years will avoid a continued succession of declining plants.

Alpine strawberries are quite hardy and normally need no special protection, but if they are in pots, the pots should be set into the ground before it freezes or they should be grouped in a coldframe and protected with straw. The plants *do* need a dormant period and will not grow indefinitely if brought into the house in August or September. It is best to winter them outside and to bring them into the house in the spring, rather than in the fall, if you want a fruit-bearing conversation piece in April or May. This is a tricky business, but if you have, for instance, some experience in forcing bulbs, forcing strawberries should seem easy enough. Naturally, there is no problem in bringing potted strawberries indoors any time during the summer if proper growing conditions are provided while they are in the house.

Uses and Varieties

Alpine strawberries are not yet well known in the United States, but are a favorite delicacy in England and on the European continent, especially in France where they are known as *fraises des bois* or "woodland strawberries." They are usually eaten fresh, with sugar and cream. They supposedly have a higher pectin content than the American commercial strawberry and, therefore, are especially suited to making jam. However, they are too delicious and seldom so plentiful that one would ever really consider cooking them up as jam. They are a bright, glossy red when ripe and have an interesting elongated, bumpy shape. There is a variety with yellow berries and it might be almost excessively elegant to serve the yellow and the red fruits mixed, as a dessert for guests.

There are a number of varieties and even the names sound interesting. One can buy seeds for the varieties 'Alexandria', 'Ruegen' (also spelled Rugen) or 'Ruegen Improved', 'Baron von Solemacher', and 'Alpine Yellow' (with, of course, yellow fruit). The seeds for these four varieties are available from the George W. Park Seed Company of Greenwood, South Carolina, and from J. L. Hudson of Redwood City, California. Seeds for one or more of these varieties can also be bought from the Burpee Seed Company of Clinton, Iowa, and from Thompson and Morgan, Seedsmen, of Farmingdale, New Jersey. Other companies sell seeds and a number of them, including White Flower Farm, Litchfield, Connecticut, sell plants of Alpine strawberries.

An ideal container plant should be small and easily manageable; should have decorative foliage, attractive flowers, and eye-catching fruit; should continue to blossom and fruit for months at a time; should be inexpensive to acquire; should be easy to propagate and grow; should be unusual and not too common; should be hardy; should bear in the same season as it is seeded; and should adapt well to container culture. The Alpine strawberry fits all these requirements. It is an ideal plant for the container gardener. ☘

AUTUMN LEAVES AND BROKEN BACKS

Leaf shredders are wonderful machines, quickly preparing a serviceable mulch for flower borders and cutting up garden debris for rapid decomposition on the compost heap. They do cause their share of back problems, though, for the fairly small hopper into which the leaves are fed by hand is usually at waist level or slightly above. This means a lot of stooping and scooping with the rake to gather a very modest number of leaves. People with shredders are happy to see winter come.

The dirty deed can be made easier if the gardener has a sense of carpentry, reports Jack Barker in *Flower and Garden*, October-November, 1980. The essence of Mr. Barker's idea is to construct, adjacent to the shredder, a box on legs, the box being large enough to hold a few bushels of leaves at one time, so the gardener doesn't have to bend down for a new load every ten seconds. The bottom of the box is slightly higher than the hopper. There is an opening in the side of the box nearest the hopper, so the leaves can be fed in by one party while the other gets together a fresh load in a large basket or burlap sheet to dump in the box. Shredders vary in shape and size, so adapt the idea for your own. Great advances of mankind! ☘

GIANT-SEQUOIA AND BLITHEWOLD

Donald R. Buma

The giant-sequoia (*Sequoiadendron giganteum*) is one of the oldest and the largest of living things on earth. Mature trees have an average diameter at breast height of from 28 to 32 feet, grow to be approximately 250 to 300 feet high, and live for 2,000 to 3,000 years. The greatest reported age of a giant-sequoia is 4,000

Author

years. The only native area for these trees is on the western slopes of the Sierra Nevada in California. The trees, never growing singly but always in groups or groves, are found where there are protected or favorable spots with deep, rich and moist soil. The average annual precipitation in that part of California is from 45 to 60 inches and occurs primarily during the winter months when snow may drift 20 to 30 feet deep and the temperature drops to zero or below.

Thousands of miles away on the opposite shores of the United States a giant-sequoia is growing and flourishing at Blithewold Gardens and Arboretum in Bristol, Rhode Island. Although only a sapling in comparison to the aged titans in California, the 85-foot height of the Blithewold tree makes it the most impressive example of the species in the eastern United States.

This particular tree was shipped to Bristol from Brooklyn, N.Y., in 1911 on a railroad car by John DeWolf. DeWolf, a Bristol native, was landscape architect of the Borough of Brooklyn. He was also the person who designed the grounds of Blithewold, the Bristol summer residence of coal-mine owner Augustus S. Van Wickle of Hazelton, Pennsylvania. The sequoia that DeWolf shipped to Bristol from New York was one of a seedling shipment sent approximately ten years earlier from California, intended for planting in Brooklyn. Planting it in Bristol has had no detrimental effect on the tree whatsoever. Its vigorous growth and healthy appearance readily attest to this.

The reason for the tree's continued good health is most likely the steady supply of moisture it receives. Although the fine sandy loam it is growing in would ordinarily drain quite readily, a hardpan between three and four feet deep holds soil moisture in an area available to the taproot-less, widely branching root system. In addition, being situated less than one thousand feet from Narragansett Bay assures a fairly high year round relative humidity.

One noticeable difference in growing habits of the Blithewold sequoia and those in California is the period to flowering and cone production. Normally the first flowering occurs when a tree is 175 to 200 years old. However, a second Blithewold giant-sequoia that is fifteen years old and fourteen feet high was propagated from a seed produced by the first Blithewold tree when it was only 65 years old. There is no known reason for this earlier maturity.

Because of the VanWickle family desire that the plants and landscape of their summer residence be preserved for future generations, the property was left in trust to the Heritage Foundation of Rhode Island in 1976. Now, as Blithewold Gardens and Arboretum, this fine example of a turn-of-the-century summer residence and 33-acre landscape is being developed as a horticultural institution. The large giant-sequoias ranging in height from three to forty feet, as well as a grove of bamboo, Chinese cedrelas and many other fine old mature specimens of exotic trees and shrubs can be seen daily from May through October. For more information write: Donald R. Buma, Director, Blithewold Gardens and Arboretum, Ferry Road, Bristol, RI 02809. ❧

HOW OLD IS THE OLDEST TREE?

Consider the oldest living things: bristlecone pines and redwood trees. The living cells in those trees are no more than thirty years old; the great bulk of the tree is made up mostly of dead cells that are not necessary for survival. Since dead cells should not be included in determining age, by this reasoning the trees are no more than thirty years old: considerably younger than the oldest nerve cells in many human beings.

Leonard Mayflick,
in "The Cell Biology of Human Aging,"
Scientific American, January, 1980

A natural cooperation for better growth . . .

RHODODENDRON MYCORRHIZAE

Larry Englander

Reprinted by permission from The Rosebay
and the Quarterly Bulletin of the American Rhododendron Society, Winter 1980*

Plant roots serve a number of important functions, not the least of which are the absorption of minerals and water and the storage of carbohydrates manufactured by the foliage. Root hairs, the tiny projections of the epidermis, occur on the roots of most plants. These hairs increase root surface area and, consequently, the number of sites at which the roots can "mine" for minerals and water. Roots do a creditable job of supporting healthy, thriving plants, but are inefficient in one respect—they leak. Often a large variety of harmless microorganisms are attracted into the root system's zone of influence (the rhizosphere) where they join a "soup line," eagerly awaiting unintentional handouts in the form of exudates by the plant roots. Through evolution, some fungi gave up the humble, patient ways of their companions and, instead of waiting outside for a handout, take their sustenance by force, penetrating and invading the root.

In this latter group are the pathogenic fungi, such as Phytophthora root rot fungus, whose tiny swimming spores use rhododendron root exudates as a beacon to direct them to the root which they proceed to infect and destroy. Obviously, only the pathogen derives benefit from this interaction. But there is another relationship that has developed between certain fungi and roots, in which the fungus may penetrate root cells but not kill them. In fact, both the root and the fungus derive benefits from this association, called a mycorrhiza.

A peculiarity of roots of rhododendrons and other ericaceous plants is that they do not have root hairs. The absence of root hairs in rhododendrons may be partially offset by the characteristic dense fibrous root system, but substituting for root hairs on many rhododendrons throughout the world are the microscopic threads of fungi in a mycorrhizal relationship.

How They Work

Although the classification of kinds of mycorrhizae is not stable because new or intermediate types of relationships periodically are being discovered, the rhododendron mycorrhizae are generally classified as ericoid endomycorrhizae, a group characterized by fungus penetration into cells on the root surface. Looking through the microscope at a young rhododendron root, one finds up to eighty percent of the surface cells have been penetrated by a fungus, each cell containing a "knot" of fine fungal filaments, called hyphae. Remarkably, these invaded root cells are not destroyed, but continue to function. Outside these cells there is a thin weft of hyphae acting like a microscopic root system, weaving together the plant roots and soil particles some distance away.

By investing part of its hyphae inside the root cell, the fungus benefits by obtaining essential carbohydrates without having to compete with the myriad of hungry microorganisms in the soil. The hyphae in the soil absorb water and minerals, some of which are translocated to the "knot" of hyphae inside the root cell. In some manner not yet fully understood, the root obtains from the fungus a share of these materials for its own use. This increases the plants' access to minerals, especially important when these materials are present in the soil in limited quantities.

Our knowledge about mycorrhizae on

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*Originally published as Contribution No. 1891, the Rhode Island Experiment Station, University of Rhode Island, Kingston.

ericaceous plants has been greatly increased by the elaborate research of a group in England, directed by Dr. D. J. Read. They were able to culture a fungus which formed mycorrhizae with cranberry, heather and rhododendron, and they demonstrated under laboratory conditions that this fungus, *Pezizella ericae*, stimulated the growth of cranberry and heather seedlings, and increased their phosphorus and nitrogen content when grown where these minerals were in a form not readily available to plant roots.

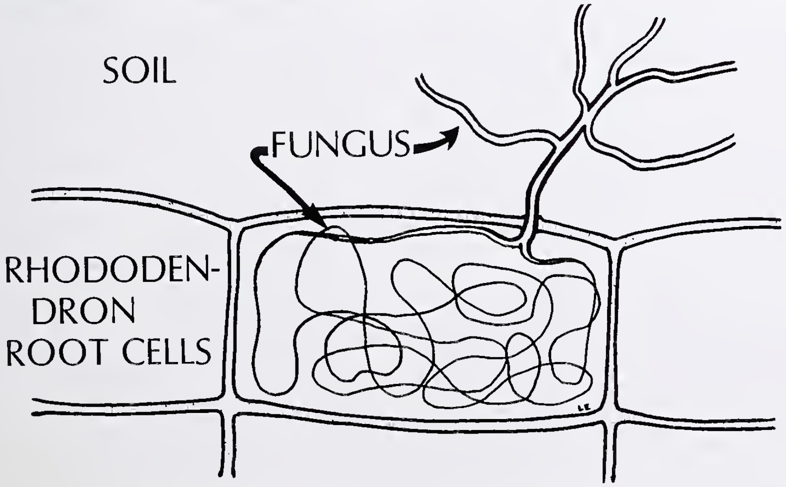
Specificity

Several years ago, I began studying another fungus as a potential mycorrhiza on ericaceous plants. The potential value of this study was indicated by the observations detailed below, and was encouraged by a grant from the American Rhododendron Society Research Foundation. Each year we found large numbers of fruiting bodies of a particular fungus on the ground beneath rhododendrons and related plants. The sites, found thus far only in Rhode Island and adjacent states, varied considerably from those exposed to full sun and wind on large expanses of flat terrain, to woodland settings where shade, wind protection and natural mulch provided a more moderate environment for the plants. Soil types varied also, but generally were of low fertility.

It was interesting to find the fungus fruiting beneath rhododendrons in home gardens, but there was indeed a spectacular sight to behold when visiting certain wholesale nurseries which grow large tracts of rhododendrons. There I found hundreds of these small fruiting bodies under nearly every ericaceous plant, and not a single one beneath any other plant, even when both types were interspersed in the same rows. The specificity of this fungus/plant relationship is striking. The fungus has been associated with many of the best known and most widely grown rhododendron species and cultivars. Other ericaceous plants found with the fungus include *Kalmia latifolia*, *Pieris floribunda*, *P. japonica* and *Leucothoe*.

The fungus fruiting bodies look like slender cream-colored stalks, generally one to two inches tall, occurring either singly or in clusters. They first appear in the autumn, at about the time of the first frost, and continue to emerge until the deep freeze sets in. Each fruiting body produces millions of microscopic spores, which are disseminated by wind to other areas, presumably to initiate mycorrhizae if they fortuitously land near the root of an ericaceous plant. Of course, these

Fungal filaments, called hyphae, penetrate the rhododendron root cells, providing soil nutrients and obtaining complex compounds for their own nourishment in return.



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readily visible fruiting bodies comprise only the reproductive part of the fungus, the remainder being a vast network of microscopic hyphae in the soil and plant roots. The fungus has been identified as a *Clavaria* species, and prior to our work had not been reported as associated with mycorrhizal rhododendron roots in the United States. It was reported in Australia in 1973, on container-grown azaleas.

An Experiment

Finding fungus fruiting bodies constantly associated with certain types of plants is *not* sufficient evidence that the same fungus is the one forming mycorrhizae on the roots. It was very difficult to trace hyphae connecting the *Clavaria* fruiting body with the root due to the microscopic size of these fragile strands and the inability to see through soil particles. Another approach to verifying the mycorrhiza-forming ability of a fungus is to "synthesize" a mycorrhiza in the laboratory by combining a pure culture of the suspected fungus with an aseptically grown plant. Thus, when mycorrhizal roots develop, this constitutes evidence that the intentionally-applied fungus was responsible. Since we haven't yet found a method for growing the *Clavaria* fungus in the laboratory, we used another method to determine whether there was a connection between its fruiting bodies and the roots—applying a radioactive isotope to one side of the plant/fungus pathway and monitoring its passage

The fruiting body (a reproductive structure) of *Clavaria*, a fungus associated with rhododendron roots.

across to the other side. We utilized the phenomena that plant sugars are passed to mycorrhizal fungi, and phosphate may be transferred from fungus to plant roots.

In the first part of the study, radioactive carbon dioxide ($C^{14}O_2$) was injected into plastic bags covering shoots of six-year-old plants of *Pieris japonica* and *Rhododendron* 'English Roseum' growing in the field at the University of Rhode Island research farm. *Clavaria* fruiting bodies under these "labeled" plants were sampled after various periods of time during which the C^{14} was assimilated by the leaves during photosynthesis and converted to sugars which were translocated to the roots.

The mycorrhizal hyphae in these roots normally take a share of these sugars, some of which contain C^{14}. If the *Clavaria* fruiting bodies were part of the mycorrhizal fungus, and therefore connected to the roots, then these fruiting bodies should become radioactive as they acquire sugars through their hyphae from roots of the "labeled" plants.

Indeed, high levels of radioactivity were measured in fruiting bodies taken from beneath the C^{14} "labeled" pieris and rhododendrons (25-fold and 121-fold increase, respectively), while weeds under these same plants, as well as *Clavaria* fruiting bodies and weeds under untreated plants, had only background (environmental) levels of radioactivity.

In another series of tests, radioactive phosphate was applied, using the P^{32} isotope, to *Clavaria* fruiting bodies under two-year-old field grown rhododendron liners ('English Roseum') which had been transplanted to the greenhouse. Subsequently we assayed root samples from at least 23mm below the fruiting bodies, and also roots from a point midway between the plant stem and the treated fruiting bodies. In most samples, roots were considerably more radioactive (approx. 20- to 600-fold increase) than control roots from plants with fruiting bodies that had not been treated with P^{32}. Additional tests showed that when P^{32} was applied directly to the soil surface rather than the fungus, there was no radioactivity increase of roots 12mm or more below the surface, nor in roots at a point midway between the plant stem and the treated soil.

Conclusion and Further Work

There appears to be an efficient two-way pipeline between mycorrhizal rhododendrons and *Clavaria* fruiting bodies. This supports the hypothesis that *Clavaria* is mycorrhizal on rhododendrons. Also significant is the ability of this fungus to supply roots with phosphorus. Roots often have only limited access to phosphate in the soil since the relative insolubility of this mineral reduces its availability in soil water. Whether mycorrhizal roots obtain more phosphate due to the "mining" of more sites in the soil by fungal hyphae or through the ability of the fungus to dissolve and obtain forms of phosphorus which plant roots cannot, is controversial.

Currently we are using electron microscopy to examine the effect on rhododendron root cells of mycorrhizal fungi, and have found that several different fungi are probably capable of forming mycorrhizae. Other studies underway are rhododendron seedling growth rates, the inhibition of ericoid mycorrhizae by fungicides, the influence of plant culture medium composition and sterilization on time and degree of mycorrhizal establishment, and physiological investigations on nutrient uptake by rhododendrons with and without mycorrhizae. We hope to continue studying the now poorly understood ericoid mycorrhizae to determine in which processes and to what degree this association is beneficial to rhododendrons, which micro-organisms are most appropriate, and how or whether our help may be required for initiating and encouraging mycorrhizae of ericaceous plants.

CENTURY-OLD SEEDS GERMINATE

Gardening gets beyond us sometimes, especially during beach days in August when pigweed, sourgrass and spotted spurge stake claim to the flower border. But deep down in our left toe, we know the spurge should be purged before it does its thing. Weed seeds have a way of persisting in the soil. Remember the old gardener's saying, "One year's seeding means seven years weeding." In fact, it can be much longer than that.

In 1879, a Michigan State University botanist, William J. Beal, began a weed-seed germination experiment which has not yet been concluded, but which brings a disheartening report from East Lansing every ten years. This being the centennial more-or-less, an update on the continuing saga may be of interest to gardeners tempted to live and let (chickweed) live.

Dr. Beal placed 1,000 seeds of twenty-or-so well-known weeds in each of twenty bottles, which were then buried almost upside down in the garden. In the early part of the experiment a bottle was unearthed and its contents sown every five years, but the period was eventually extended to ten because germination had been so successful in the initial stages.

In last year's sowing, 29 of the 1,000 seeds from the fourteenth bottle germinated. Of them 26 were moth mullein (*Verbascum blattaria*). Consolation: the other seeds had nearly all run their course, and germination of the mullein took three times longer than it would with fresh seed. Tune in ten years hence for a report on bottle number fifteen. For more details, see *Crops and Soils Magazine* (American Society of Agronomy), October, 1980, pp. 19-20. ☙

Gottscho-Schleisner

Moth mullein (*Verbascum blattaria*) which still germinated after one hundred years. One consolation: it has lovely yellow flowers.

All photos: Author

THE ADAPTABLE BOSTON FERNS

F. Gordon Foster

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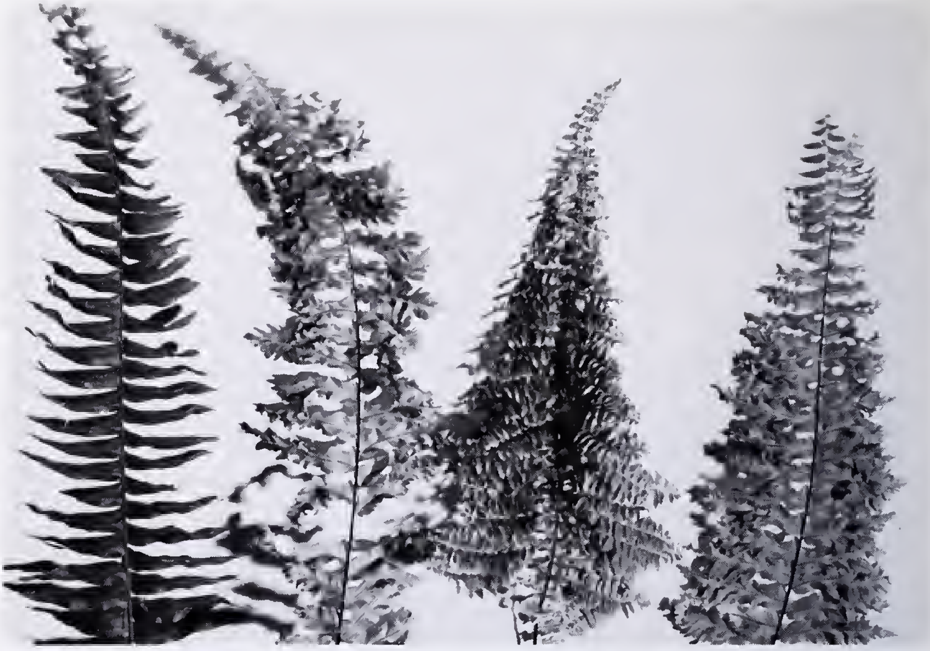
To the historian, the word "Boston" may suggest a late-evening tea party held in a cold, murky harbor. To the horticulturist, "Boston" can mean only one thing—a fern, one that has held a prominent position in the American home for nearly a century.

Actually, the name "Boston" is loosely applied to a group of ferns all having had their origin from *Nephrolepis exaltata*, the wild sword fern of Florida. Normally this fern prefers an epiphytic life, choosing as its home the cabbage palmetto or any rough-barked tree that offers a foothold.



Leaves of Boston ferns vary from mutation to mutation and also differ among individual plants. On the left is a one-pinnate leaf similar to the progenitor, *Nephrolepis exaltata*.

In nature this fern never produces the beautiful plants seen in homes. Rather, a mature plant is limited to three or four long leaves hanging down from an exposed root system. Long before maturity, the plant sends out numerous wiry stolons and new plants start growing at frequent intervals until the tree trunk is covered.

How They Started

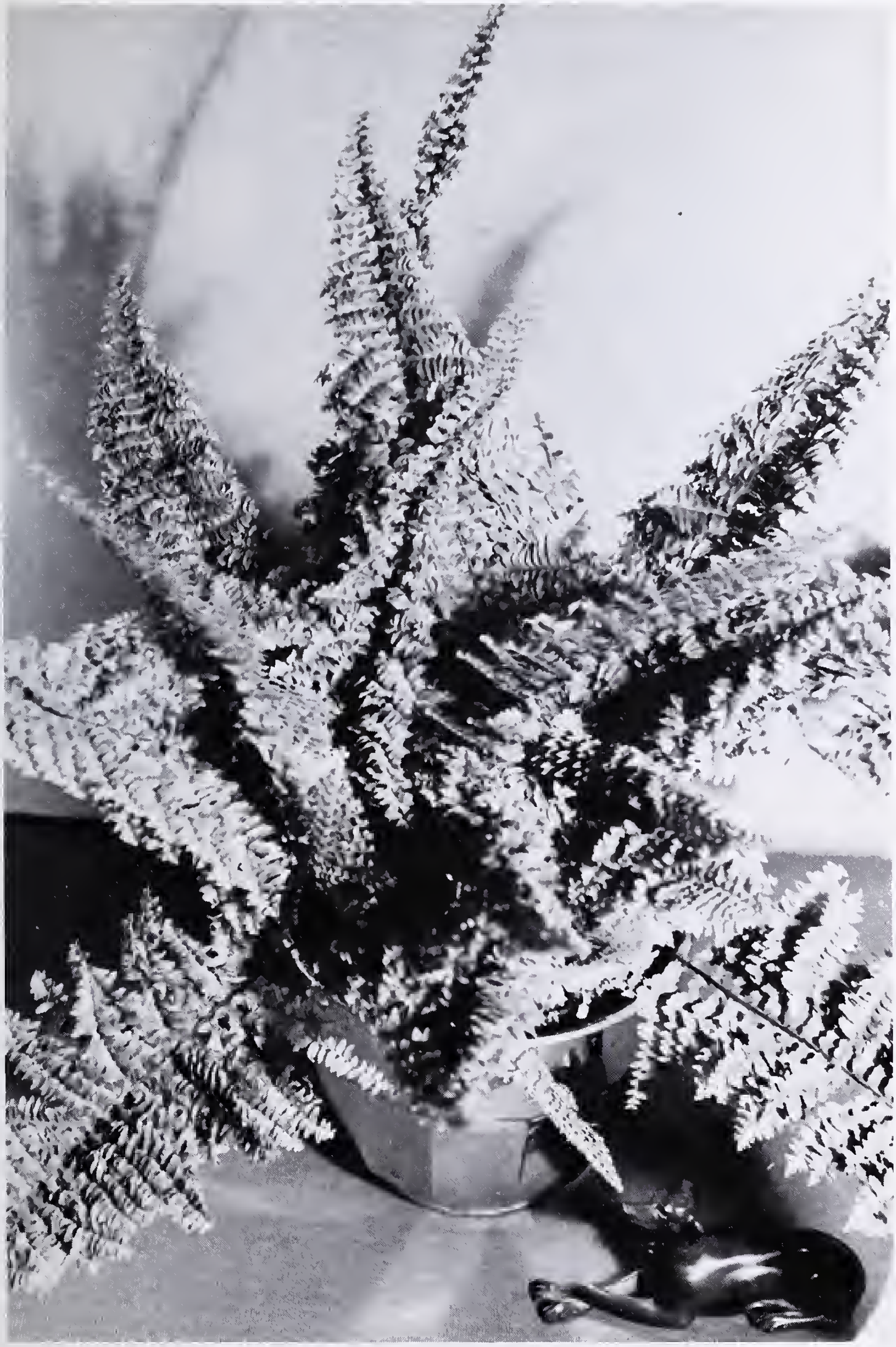
The history of Boston ferns starts around 1895. At that time thousands of wild sword ferns were collected in Florida and shipped to a distribution center in Philadelphia. These naturally-grown ferns had pendulous leaves, often reaching five or six feet or more. By some fortunate circumstance, in a shipment sent to a Boston plant market, one plant in particular differed from the lot.

Horticulturists recognized this fern not as a distinct species but as a variant of the thousands that had already passed through commerce. To identify the different fern and also to honor the city in which the discovery had been made, the plant was named *Nephrolepis exaltata* 'Bostoniensis'.

'Bostoniensis' was an instant success. A new market sprang up overnight. By the turn of the century, large plants with overflowing leaves had become a status symbol of the post-Victorian parlor.

The original Boston fern continued to hold an undisputed position until around 1903. Then, in a commercial greenhouse in Tarrytown, N.Y., operated by F. R. Pierson, a mutation from 'Bostoniensis' was discovered. Unlike the original Boston mutation, the departure from the norm was not so subtle, the fern now having changed from one- to twice-pinnate leaves.

To officially identify the new mutation, another name 'Piersonii', was added to an already overburdened nomenclature. From this it later appeared that a chain of mutations had been started with leaves becoming multipinnate and shorter, all giving the plant a more pleasing, compact and bushy appearance.



'Fluffy Ruffles', a mutation, has erect, bushy leaves.

Boston ferns often show reversion from multi-pinnate leaves to the original single-pinnate, prominent in the center of this specimen.

About 1915, Dr. Ralph Curtiss Benedict, then a young man associated with the Brooklyn Botanic Garden, started a thorough study and collection of these fast-changing mutations. Throughout his life Dr. Benedict was an ardent fern enthusiast and, starting at almost the inception of these bizarre plants, wrote many valuable monographs.

In one of his articles, Dr. Benedict attempted to set up a non-descriptive key or, more accurately, a family tree, showing the complex derivation of over sixty mutations. He collected and examined hundreds of these specimens but, then as now, consistent naming of the plants was virtually impossible.

Varieties

Boston ferns are still unstable. In visiting a growing nursery it is possible to see two or three different leaf types on one plant plus a reversion to the original plant.

Boston ferns are excellent houseplants and adapt themselves better than many other ferns. In making a selection, forget the all-too-confusing names and buy a plant that appeals, keeping in mind the ultimate purpose for which it will be used. I prefer to acknowledge three general categories of Boston ferns and group them as follows:

A. Plants having long pendulous leaves that are suitable for pedestals. These are like the original Bostoniensis.

B. Plants having short, flowing and upright leaves for pedestals or hanging baskets.

C. Plants developed from a long line of mutations that have become bushy. One in particular, available in most chain grocery stores and discount houses, is called 'Fluffy Ruffles'. This is an inexpensive plant and when properly attended and groomed makes a delightful accent in any room.

Examine a large Boston fern and you will find that it is not a single plant but instead is a potful of smaller plants. Originally starting with a solitary plant from a stolon, more plants have developed to form what appears to be a large compact form.

Rather than buying a large fern, I prefer to buy three small plants growing in porous clay pots. With the plants still in their pots, I put them in a colorful jardiniere and pack them with damp peat moss, carefully concealing the rims of the individual pots. Arranging the leaves will quickly give the assembled plants an appearance of solidarity, and the damp peat moss will encourage the stolons to reach out for further propagation. For another method of displaying Boston ferns, fill a planter with damp peat moss and alternately space the ferns with seasonal flowering plants.

When warm weather returns, consider putting the ferns in the ground where the stolons will quickly wander from their pots to establish new plants. Late in August, pot the new ferns either individually or with several in a large pot.

Growing Them

Here are a few cultural suggestions that should lead to success.

Watering: These plants are epiphytic and in nature receive rain water at intervals with near-dryness between showers. Water plants thoroughly; even immerse them in a tub if necessary. Then allow the soil to reach near-dryness. Overwatering can cause yellowing and dropping of leaves and eventually a dead fern. An overall weekly spraying in the kitchen sink or shower, with slightly warm water, is most refreshing.

Light: The best location is near a window with full light, but very restricted or filtered sunlight.

Temperature: A cool day temperature is best. Avoid placing ferns near any heating ducts or radiators.

Feeding: During the active growing season feed the plant monthly. I still prefer emulsified fish oil, but not just an hour before dinner guests arrive!

Propagation: Normally ferns reproduce sexually by means of their spores which grow on the undersides of their leaves or on specialized leaves. Boston ferns are an exception. As a rule, they do not have the usual spores. Propagation is easily accomplished by encouraging the stolons to travel along the surface of the growing medium. Rooting takes place at intervals along the stolons where leaf budding occurs. When the young plant is well established, the stolon may be clipped and the fern individually planted.

Grooming: Older leaves, those on the outside of the plant, eventually die, a condition not to be confused with overwatering. These should be removed. Stolons will appear throughout the foliage.

Repotting: Leaves of Boston ferns grow from ascending rhizomes and in time become leggy. In this case, remove the plant from the pot, shake off the exhausted growing medium and repot at a lower level. Eventually repotting of all large Boston ferns will be in order. Since the original plant is now composed of many smaller, additional plants that have developed, separate the large plant and form two or three new units.

A soilless mix of equal parts of peat moss, hyperhumus, coarse sand and perlite is a good soil medium having a balance of moisture retention and aeration. ☘

YOU CAN'T KEEP A GOOD RUSH DOWN

Only three weeks after the eruption of Mount St. Helens on May 18, 1980, horsetail (*Equisetum hyemale*) was found sprouting on ten inches of ash on the northwest side of the mountain.

—*The Avant Gardener*

Photos: Burpee Seeds

VEGETABLE OF THE YEAR: THE SUGAR SNAP PEA

Jane Pepper

Reprinted from THE GREEN SCENE
(Pennsylvania Horticultural Society), January-February 1980

They were Burpee's best-selling vegetable last year. Seed companies throughout America sold more than 550,000 pounds of them, and more than eight million gardeners planted at least one row of this new delicacy. Of course, I'm talking about the wonder vegetable of 1979, the sugar snap pea. In 1978 it was awarded the All-America Selections Gold Medal; one seed company featured it on the cover of its 1979 catalog, and the horticultural press sang its praises from late winter through early spring.

Gardeners are typically adventurous and eager to try new varieties. The advertisers said the pods were edible but unlike flat-podded snow or Chinese peas, which must be picked young, they said sugar snaps could be picked when the peas are fully mature and the pods full size. We grew them in our garden and loved them, and I wondered how other gardeners felt about their first experiences with sugar snaps. I also wondered if they considered the peas had lived up to the claims of their advertisers.

In late fall my curiosity got the better of me, and I made an informal survey of Delaware Valley (Pennsylvania) gardeners. More than twenty sugar snap growers responded to my questionnaire and an outstanding ninety-five percent enthusiastically said they plan to grow sugar snaps next year. Eighteen out of twenty-three respondents could foresee the day when they would grow only sugar snaps in lieu of snow peas and regular peas. Some have already converted. Only one person preferred snow peas to sugar snaps. One family mentioned that they liked the sweetness of sugar snaps but found them too bulky in an otherwise finely cut Chinese dish. Several mentioned that they preferred sugar snaps to snow peas because you could harvest the pods over a long period. Snow-pea pods tend to turn tough and stringy almost before you have a chance to pick them. One gardener indicated that she will continue to grow regular peas as well as sugar snaps because the regular peas bear much earlier. She specifically mentioned 'Sparkle'.

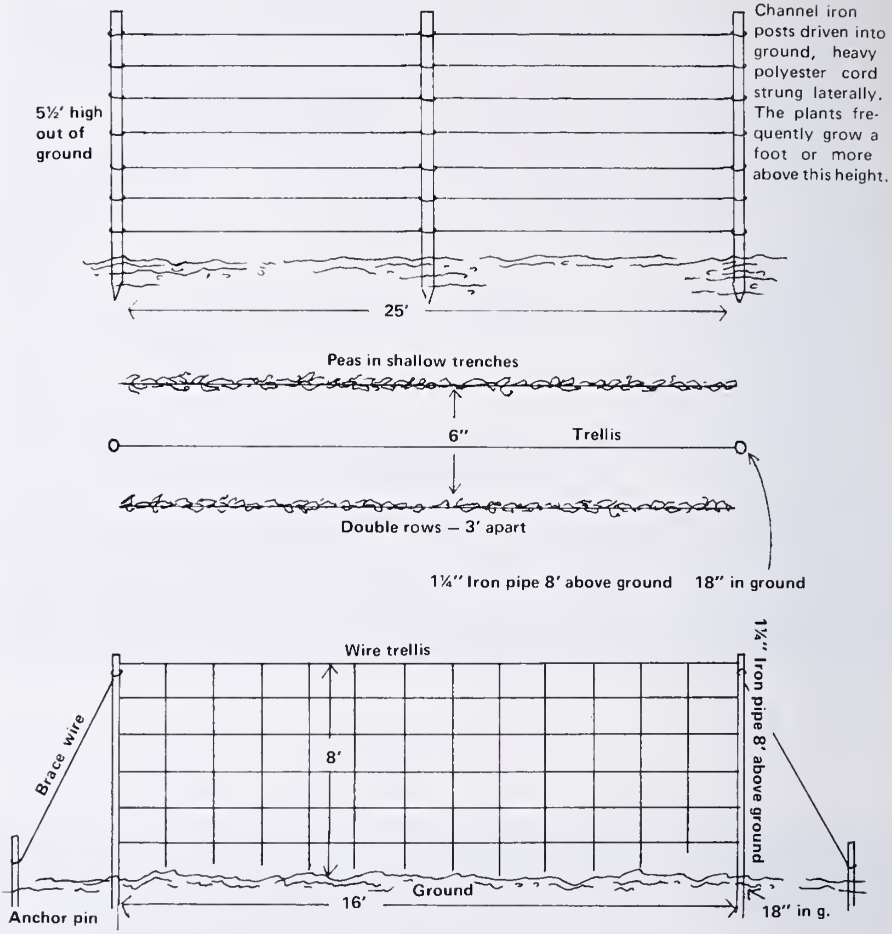
Comments on germination and yield were mixed. Some mentioned prolific yield, other were disappointed. We found them prolific and were delighted because they produced good pods through early July. First-time sugar snap growers should be aware that they will produce later in the season than early varieties so don't get impatient for your crop. Some gardeners were troubled by poor germination: try adding a fungicide such as Captan next year. Despite the wet spring we had no germination problems, but the soil in our vegetable garden drains very quickly.

When it came to consuming the harvest most people seemed to favor sugar snaps raw in salads or with a dip or cold cuts. We tried boiling them for a very short time. This was not nearly as successful as when we stir-fried them in our wok. The sweetness of the pods increases as they grow so you should not harvest them until they are fat. Some gardeners were enthusiastic about sugar snaps as a frozen vegetable. James Wilson, Executive Secretary of All-America Selections, had received a few negative comments about frozen sugar snaps, but said that several of the correspondents agreed they had probably blanched the pods for more than the recommended two minutes. When we were satiated with pea-pod salad we started shelling them to serve as regular peas. We thought they were delicious; some respondents mentioned that the pods were difficult to split.

A Bit Too Tall

In addition to general agreement that the advertisers of sugar snaps were generally telling the truth, there was agreement

SUPPORTS FOR SUGAR SNAP PEAS IN THE GARDEN


5½′ high out of ground
Channel iron posts driven into ground, heavy polyester cord strung laterally. The plants frequently grow a foot or more above this height.
25′
Peas in shallow trenches
6″
Trellis
Double rows — 3′ apart
1¼″ Iron pipe 8′ above ground
18″ in ground
Wire trellis
1¼″ Iron pipe 8′ above ground
Brace wire
8′
Ground
16′
Anchor pin
18″ in g.

Julie Baxendell, The Green Scene

over another sugar snap issue. Supporting these tall growers is a problem. The chicken wire we use to support the traditional peas is only three feet, the string netting five feet in height. I was too cheap to purchase taller wire—and in any case I didn't believe the advertisements which said that they would grow from six to eight feet tall. By early May the peas had covered our fence. When we finally pulled them out they were bent double, pulling the fence down with them but continuing to produce.

Vegetable breeders, I am told, are aware of this problem and hope within a few years to produce a smaller-growing sugar snap. The owner of one large seed company indicated that a dwarf sugar snap pea has already been developed in Europe, but it is disappointingly tasteless when compared to the remarkably sweet taller variety.

In response to my request, several gardeners provided cultural instructions for sugar snaps. Andy Graham of J. Franklin Styer Nurseries mixed two parts 5-10-5 with one part Earth-Rite soil conditioner and placed the mixture in the row at time of seeding. Andy's crop was "prolific." Mary and Wilbur Zimmerman recommend using a fertilizer high in phosphorus. Austin Mims of Doylestown tilled a combination of a 3- to 4-inch layer of rotted leaves, 10-10-10 fertilizer and lime into the area in which he planned to plant sugar snaps. After the peas had made considerable growth he side-dressed the rows with additional 10-10-10. His peas (not surprisingly) grew quickly, and seemed to fall away from the 8-foot trellis. Mims secured them with binder twine.

Enough sugar snap seed was sold in this country for the 1979 growing season to fill 5½ boxcars. Almost half as much again went overseas to Japan and Europe. Next year the developer of sugar snap peas, Gallatin Valley Seed Company of Twin Falls, Idaho, plans to increase its distribution to seed suppliers by fifty percent. The bulk of this will go to home gardeners. At present sugar snaps are difficult for commercial growers to handle because of their height, but they are becoming popular in restaurants and gourmet vegetable stores. At $4.00 a pound in a chic San Francisco market they probably represent a vegetable for the elite. Just think—you and I can grow as many as we please in our gardens for a fraction of that cost.

Recipe Booklet Available

All-America Selections has prepared a book of sugar snap pea recipes. Send 50¢ to Paula Lion, All-America Selections, 1186 Los Altos Avenue, Los Altos, CA 94022. Please include a stamped, self-addressed business-size envelope with your request.

MORE USES FOR BLACK PLASTIC

Black plastic (polyethylene) is as handy to gardeners as Scotch tape is to scrapbook makers. Its use in the vegetable garden as a mulch to suppress weeds and keep moisture in the soil saves a good deal of labor and usually results in a fine crop. In addition, a good thick mil of black plastic has a place as a weed suppressant in hard-to-mow areas, as between a stone wall and ditch, or on a slope. (A thin top layer of pine needles or shredded leaves helps, for no claim can be made for black plastic's aesthetic qualities.)

Sometimes black plastic is placed around a group of shrubs to make an island bed so the lawn mower doesn't always have to be maneuvered in and out. If the shrubs are young or shallow-rooted (rhododendrons, azaleas, mountain-laurel), the practice may do as much harm as good, since surface-rooting is encouraged by the plastic. However, around well-established shrubs, at least for a year or two, the problem does not appear important, though the piercing of a few holes in the plastic is a precaution which the wary may wish to heed. Well before that time, the turf underneath will have died and the black plastic can be removed, with the layer of needles left to serve as the longer-term mulch, to be replenished each spring. Well-mulched shrubs, unless they are drylanders, grow demonstrably better than unmulched ones.

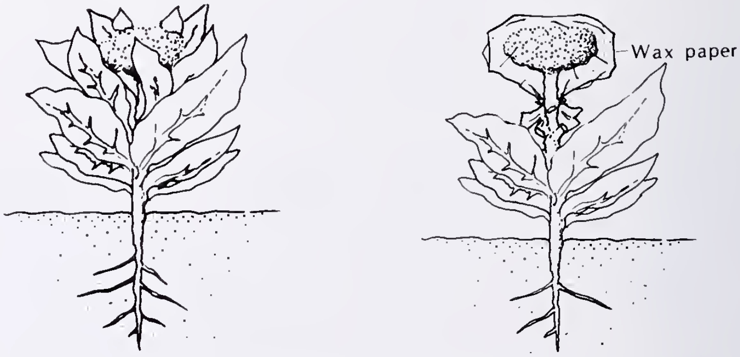
Another use of black plastic is in making a flower border where there presently is grass. Instead of the turf being removed, it is merely covered for a few weeks during the growing season by black plastic, which is first cut with scissors to the contours of the border-to-be. A few strategically placed rocks will keep the plastic in place. The warmer the weather, the quicker the demise of the grass will be. The dead turf, full of organic matter, can then be dug under and the border prepared with routine soil amendments (compost or peat moss, coarse builder's sand if needed, and fertilizer). This will raise the border slightly, which is beneficial for good drainage and early-spring workability.

The wave of the future is occurring in England now. Firmly molded plastic and clay pots in perennial nurseries are being replaced by flexible black plastic shaped as containers. They are inexpensive (for the nursery), lightweight and easy to handle, though also easy to pierce because of their flimsiness. Brace yourself—they will be here before long.

A CAULIFLOWER MELANCHOLY REMEDY

Ah, cauliflower. If you tie up the leaves to blanch the head, you can't get at the head to spray for pests without untying and retying and wondering if it's worth the effort. This ritual was too much for a gardening friend on the Connecticut Shore. Refining his grandmother's method of clipping back the leaves and covering the head with a pillowcase, he first tried polyethylene wrap (wouldn't stick), then foil (encouraged fungus), then hit on wax paper. He clips back the leaves closest to the head (about ¼-⅓ of the total leaves) to isolate it, then covers it with two sheets of wax paper placed x-fashion over the head and crimped around the stalk. The paper's natural crushability keeps it close to the head, yet it can easily be removed to treat for pests. Despite wax paper's relative translucence, it is sufficiently opaque to blanch the head to a snowy white.

His plans for next year? Well, he's thinking of experimenting with freezer wrap, same method, but perhaps he won't have to replace it after a heavy rain, the only drawback to the wax paper.



Russell Peterson

Left, a young cauliflower ready to be tied up. Right, with leaves trimmed back, the head is wrapped in wax paper.

SPARE THE RAKE, SAVE THE FERTILIZER

A lazy lawn-mowing friend of ours, Kelly Green, spent much of his time this past summer basking in a hammock—with a good conscience. For years the gardening books have told him to rake up grass clippings regularly after mowing lest all sorts of bad things happen. Kelly hasn't paid much attention to the advice, and this year he finally received justification when the Connecticut Agricultural Experiment Station (New Haven) reported that more than half of the nitrogen applied to a lawn in fertilizers can go back to the soil if grass clippings are not removed. Moreover, contrary to the conventional horticultural wisdom, it has been shown that clippings add very little to thatch build-up.

Cornell and Michigan State universities have come to essentially the same conclusion about clippings. Only if the grass gets quite tall between mowings, as happens at Kelly's from time to time, is it really desirable to rake.

WHERE HAVE ALL THE OLD-TIME FLOWERS GONE?

Frederick McGourty

Adapted from THE AVANT GARDENER, July 15, 1980

Some time ago I begged a slip of a peony from a friend who is also a mossback. This wasn't a fancy new hybrid. Instead, it was a rather dowdy purplish-pink bloomer with average-size flowers and faintly mysterious scent. My grandmother wore dresses like that peony. Our friend doesn't know its name, nor do I, for it probably dates from the last century and has long since been discarded by nurseries, though a few of the old-timers are still around. The peony came from the cellarhole of a house that burned to the ground in the 1930s after a murder and suicide. This added spice. After all, a plant is more interesting to grow if you know its history.

There is a small cemetery on a barely negotiable dirt road near our home in northern Connecticut. It has but a dozen graves, the most recent dating from 1870. A child's tombstone is almost completely embedded in a sugar maple tree which has a trunk 3½ feet in diameter. One epitaph reads, "In heaven there is rest." On earth there was little, at least for a rural New Englander in the 1860s.

As often as not, those who survived the Civil War did not want to come back to the hardscrabble existence of the Connecticut farm, where the major crop was rocks, and these could not be turned to gold. They listened to Mr. Greeley and indeed went west, to Ohio, Wisconsin, the fertile and great plains, and California. Slowly the little cemeteries faded, and no longer does the American Legion post flags in them at Memorial Day.

But the plants, or some of them, go on. Don't they do well! Is it our imagination that a few grow lushly on the phosphorus released by Old Eben? There is the creeping rose no one now living has a name for. Perhaps it never had a name, just was passed over a fence. Or purveyed by an itinerant nurseryman who bought slips from plant promoter William Robert Prince of Flushing, New York, who himself ended a stormy career by peddling patent medicine in the West from the back of a wagon.

The feral summer phlox (*Phlox paniculata*) goes on in the old cemeteries despite yearly battles with mildew and no recourse to Benlate, the systemic fungicide which so easily controls it on the handsome Symons-Jeune sorts we grow in gardens today (thanks in part to the promotional efforts of one Amos Pettingill of 20th-century Litchfield). Though its range extends north to New York, summer phlox in the wild is particularly associated with the American South. The irony is lost on Old Eben.

Other old cemeteries, but not ones of quite the vintage I have described, have *Achillea ptarmica* 'The Pearl', a double-flowered yarrow which originated in the great French nursery of Lemoine, the lilac breeder. Little buttonlike flowers, most notable in chrysanthemums, were popular late last century and in the early years of ours, so it is not surprising that 'The Pearl' had great appeal. Derived from a European weed, it was, if anything, adaptable, and little slips were easy to uproot and pass over the fence (or, on their own, go under it).

Lemon and Tawny Day-Lilies

Occasionally my wife accuses me of being a grave robber and, to a degree, that is true. One nineteenth-century cemetery I know has a solid patch of the sweetly scented lemon day-lily (*Hemerocallis flava; H. lilioasphodelus* of some botanists), which blooms in late spring.

The lemon lily is a plant that some hemerocallis hobbyists have forgotten in their mania for bigger-flowered sorts and ones with recurved petals or freaky frills. Hardly a nursery sells the real article

All photos, George Taloumis

The Lemon daylily (*Hemerocallis flava*), a colonial survivor originally from the Far East.

anymore, for it has been "superseded." As a taxonomist and apart from any sentiment I have for particular plants, I think it is important to treat true species, ones that are known in the wild in some part of the world, with a measure of horticultural respect even if their ruffles may not in all cases be fluffy enough for the Saturday-morning hybridist. There are sound genetic reasons for this, since once a species "goes," the gene pool declines. But we read enough about this in the newspapers today.

Fortunately the lemon day-lily, though not nearly as common as its summer-blooming big sister, the tawny day-lily (*Hemerocallis fulva*), is in little danger of dying out from old gardens, and it is still passed over the fence to new growers by those who appreciate that sort of thing. There are at least several old-time cultivars which were never named or whose names are lost in the mists of time.

This small-leaved day-lily, originally native from Eastern Siberia to Japan but grown in America since Colonial days, happens to be an excellent garden plant, with hardly a pest. Eventually its rhizomes make a dense stand which no weed can penetrate. I have seen a fifty-year-old clump growing near a firmly entrenched common lilac, a shrub which with age develops a stubborn suckering habit. It was a case of irresistible object and immovable force, and both plants were holding their own at the line of demarcation.

The tawny day-lily (*H. fulva* 'Europa') is in some respects the most remarkable perennial from Asia to reach American shores, and it came to us, as did most of the Colonial arrivals, via England and Europe. It happens to be a clone, one named 'Europa', and every plant is genetically identical. The plant does not set seed (though the pollen is fertile), and its spread through America has been by vegetative means. Floods, chipmunks, man, and goodness knows what else, break off little pieces of rhizome and they take root almost anywhere. I have seen the tawny day-lily in Maine, in roadside ditches around Roanoke, Virginia, even near the Okefenokee Swamp in South Georgia.

There are probably few states where it is not naturalized.

It is an amazingly difficult plant to put under. Once, when starting a new compost heap which eventually grew five feet tall, I threw a tawny day-lily in the bottom. Two years later, when the heap was finally depleted, the plant resumed active growth.

I suspect that one clump of tawny day-lily on a crossroads not far from our home dates from the eighteenth century because a stagecoach inn of that period was adjacent for a few years. (Lily-of-the-valley also grows nearby.)

This clump is a particular delight for Mary Ann and me in late June, because we pick the flower buds when they are small and simmer them two or three minutes, as reasonable people do garden peas. The taste is a subtle cross of asparagus and snap bean, but don't tell anyone—Craig Claiborne may be listening. In China the day-lily has been grown for kitchen use since ancient times, and several parts of the plant are palatable.

'Kwanso' is a double-flowered version of the tawny day-lily. It arrived in America much later, probably in the middle of the nineteenth century. Because of the doubling, the blossom looks like a tawny day-lily that is out of focus. It is a vigorous grower and is still seen in many old gardens—even in East Hampton and the Bronx. 'Kwanso' starts to flower shortly after the tawny day-lily but blooms longer. An unstable sport with silver-variegated leaves, apparently more common in the old days, is still sometimes seen.

Irrepressible Feverfew

I expect the feverfew (*Chrysanthemum parthenium*) will survive in our own garden, as it has in so many others. How we wish we could go back in time and speak but five minutes with each owner of our two-hundred-year-old house! My first question would be, "OK, which one of you planted the feverfew?" Was it there when Mr. Lincoln was President? Even more remotely, does it perhaps antedate the French Revolution? Was it for medicine (a febrifuge) or ornament? Or did the previous owner, a classics professor, enjoy the idea of cultivating a plant that was held in esteem by the Ancients, including Plutarch, who in the first century A.D. recounted a then-old story that its properties had saved the life of a construction worker who had fallen during the building of the Parthenon? Such musings help pass the time on a warm spring day as we uproot the excess seedlings and rub the aromatic foliage between our fingers.

Upon frustrated occasion Mary Ann and I have tried to eradicate the feverfew and, fortunately, failed. Five years ago we decided to join, not fight it, and to treat feverfew as the chrysanthemum it is, albeit a rather scrawny one. So plants are pinched two or three times in spring, or sometimes just clipped with hedge shears if we are busy. A light fertilizing follows. The result by the middle of July is a winsome profuse-flowering cousin of the ox-eye daisy of the field, in miniature. Bloom continues to Labor Day, and an attempt is made to remove the deadheads so there will be no forest of seedlings the next spring. We miss a few because our gardening energy declines in August, and so the future of this short-lived perennial from the Old World is assured. As if there

Chrysanthemum parthenium 'Golden Ball', one of several garden varieties of feverfew. They freely seed; a factor that favors their survival.

Blackeyed Susan, a native wildflower, has renaturalized in most areas.

had been any doubt. I wonder how they treated it in Martin Van Buren's day.

In fact, the settlers and their immediate successors did not have much time for ornamental plants except perhaps in the South, where boxwood in the view of some became a curse on horticulture, though enlightened men like Thomas Jefferson tried to keep the field of interest broad. In the cities, it seems that flower gardens were in front yards but cottage gardens never quite evolved as in England.

Herbs Gone Wild

Most of the plants, apart from vegetables (and not many of them at that, by today's standards), were herbs. They were grown for home remedies, for kitchen purposes to relieve the monotony of a restricted diet or to disguise gamy meats, and for fragrance when dried. The air in homes was stale, especially in winter, and people didn't bathe often.

Early herbs, practically all of them brought from the Old World, included artemisias, sage, lavender, mints, chives, santolina, garden-heliotrope (*Valeriana officinalis*, a roadside escape even now, and less known, a catnip substitute); also, orris root (*Iris florentina*) with its haunting gray-white flowers, and sweet cicely (*Myrrhis odorata*), a fernlike perennial with licorice-scented leaves which, when chopped, are a refreshing change from tarragon in salad.

All of the plants mentioned above have a role in the garden today, and some of them are rather fine perennials despite an Achilles heel or two. Studlike flowers should not be expected, though a few of these old-timers can dominate a border when in bloom. Others, while attractive, move from garden to field faster than an aphid finds a modern hybrid tea rose. Early fugitives included coltsfoot (*Tussilago*), used in cough remedies, angelica (confections), tansy (*Tanacetum*) (for Easter pudding), teasel (*Dipsacus*), used in combing wool, and lady's bedstraw (*Galium verum*), a dye plant. This account does not concern itself with woody plants, but it may be of interest that the first Old World tree to escape was proba-

Lily-of-the-valley will persist and spread indefinitely if left alone.

Martha Washington plume is still a mainstay in the traditional perennial garden.

bly the peach; it was cultivated even by the Indians.

Not surprisingly, a large proportion of perennial flowers came from Europe. Among them were golden-marguerite (*Anthemis tinctoria*) whose finely cut leaves and yellow flowers still grace many an early-summer-flowering border; also, dropwort (*Filipendula vulgaris*, formerly *F. hexapetala*), with handsome dissected leaves but inconspicuous white flowers that one wouldn't write home to Kew about, though a double-flowered sort, 'Flore Pleno', can be a refreshing sight in June. Dame's rocket (*Hesperis matronalis*) was another, with sweetly scented, magenta phlox-like flowers. Late one May, when we drove the width of New York State, it was the most common of all the flowers of the field. A white variant was one of Marie Antoinette's favorite flowers. In some areas ragged robin (*Lychnis flos-cuculi*), a plant mentioned by Shakespeare, is as frequently encountered. A field of its misty pink flowers suggests a painting by Monet.

The impression shouldn't be given that only foreign plants (literally, exotics) were grown. Butterfly-weed (*Asclepias tuberosa*), red bee balm (*Monarda didyma*), wild blue indigo (*Baptisia australis*), stokesia, lupines and delphiniums were natives that gained acceptance. As the nineteenth century moved along there were cultivars of the indigenes, two of the best known being golden-glow (*Rudbeckia laciniata* 'Hortensis') and Martha Washington plume (*Filipendula rubra* 'Venusta').

Do the old-timers still have a place in modern gardens? They probably don't for many people, especially those taken with the notion of being the first on the block to grow a new phlox, day-lily or iris. For others, the charm of simplicity, durability and, often, fragrance, is important. This is not to say that the old-timers were necessarily better garden plants (some were obviously not), but in many cases they will be around long after many thoroughbred cultivars of today have been forgotten. And there is a certain innate pleasure in growing—and enjoying—the same plants our forebears did.

MEMBERS' SEED DIVIDEND

Would you like to grow a couple of favorite flowers of the field of the American Midwest? This winter Brooklyn Botanic Garden is making available seeds of two hardy perennials, members of the Daisy (Composite) Family that are of interest in the flower border, or possibly to "meadow" gardeners who might like to experiment with them under local conditions.

Photos: S.B. Harper, M.D.

Purple coneflower (*Echinacea purpurea*) (right) is known to gardeners mainly through two or three selected varieties sold by perennial nurseries. The one we are offering is the typical species as it is found in the fields of Wisconsin. It bears a superficial structural resemblance to the black-eyed Susan and in fact was once placed in the genus *Rudbeckia* by botanists. The "petals," actually ray flowers, are purple and pendulous. The "eye," or disc flowers in the center of the bloom, elongate and harden after bloom. They are excellent in dried flower designs. Flowers: July-August, occasionally repeating. Plant height: 3-4′. Requirements: average-to-good garden soil, good drainage, and sun the better part of the day.

Prairie coneflower (*Ratibida pinnata*) (below) looks a bit like a small badminton shuttlecock, with reflexed yellow ray flowers and a protruding green disc. It is not as showy as the purple coneflower but makes a good companion for it and is attractive in numbers. Character and growth requirements are much the same as for prairie coneflower.

The seed dividend is a gift of Dr. Samuel B. Harper, a BBG member in Wisconsin who has a strong interest in meadow gardening. If you would like a sampler, send a stamped, self-addressed envelope to: Editor, Brooklyn Botanic Garden, 1000 Washington Ave., Brooklyn, NY 11225. ☙

Photos: George Taloumis

Nasturtiums along a stone wall

THE TOP TEN FLOWERING ANNUALS

Ray Rothenberger

Reprinted from GARDEN SPOTLIGHT
(Cooperative Extension Service, University of Missouri), January 21, 1980

A recent National Garden Bureau survey of the most popular flowering annuals ranks them according to the amount of seed sold. The placings in order are zinnia, marigold, petunia, nasturtium, sweet-alyssum, china-aster, morning glory, portulaca, snapdragon and sweet pea. Although petunias become number one when based on the number of *started* plants sold, and many other plants in the latter category are also important (e.g., impatiens, wax begonias), these top ten annuals from seed deserve consideration in planning the summer flower garden this year.

The Front Runners

Zinnia, a plant native of Mexico and Central America, is one of the most easily-grown annuals for seeding directly into the garden. This, along with the wide range of colors, flower forms, and plant sizes, makes it easy to see why zinnias are so popular. Few pests bother zinnias,

Dwarf marigolds, chrysanthemums and sweet-alyssum in a border.

The formal but shaggy-headed flowers of China-aster 'Pink Lady'.

Sweet peas trained on a trellis.

A carpet of portulaca near a granite outcropping overlooking an ocean inlet.

Lilliput zinnias contrast vividly with the dark green yew hedge.

although powdery mildew often attacks leaves in late summer. Fungicides may be used to control this disease, but new varieties with greater resistance are becoming available.

The flower in second place is also a native of Mexico although we generally know them as French or African marigolds. Marigold seeds also may be successfully planted directly into the garden. However, for earlier bloom, plants should be purchased or seeds started indoors. Color of marigolds is limited essentially to yellow and orange shades but many plant forms and sizes are available. Marigolds are suitable for any location in the sun. Leafhoppers are their greatest enemy. Sometimes diseases, such as aster yellows or fusarium wilt, may attack them. Diseased plants should be promptly destroyed.

Petunias come from Argentina, but modern varieties, of which there are many, are greatly changed and more attractive than the species. Because the seeds are extremely small they should be started indoors or purchased as started plants. They are best suited to sunny locations. They have few pests although diseases may attack them if they are planted in poorly drained areas or kept overwatered.

Nasturtiums, native from Mexico to Peru, are easily grown from their large seeds. Direct seeding outdoors is usually done since they are harder to transplant than many other annuals. Both trailing and climbing types are available. Black aphids that sometimes attack the undersides of their leaves may be their greatest problem.

Sweet-alyssum ranks high because its low growth makes it excellent for edging, and no plant is easier to grow or has a longer flowering season outdoors. It

Petunias in varied colors form a striking outline for a bed of perennials.

Because they are available in so many sizes, marigolds are especially useful annuals.

flowers in five or six weeks when directly seeded in the garden. This plant, from the Mediterranean region, is actually a perennial in warm climates. Sweet-alyssum is practically pest-free although flea beetles may attack young plants when they are first set outdoors in spring.

Five Others

China-asters, ranked sixth, and sweet peas, ranked tenth, are less suitable for Missouri's hot summer climate than they are in some other parts of the country.

Asters are subject to several diseases that persist in the soil as well as one carried by insects. Unhealthy plants should be pulled up and destroyed as soon as noticed. Planting location should be rotated every year.

Sweet peas are cool-weather plants. If planted very early in spring, and cool weather persists, plants may flower well. When hot weather arrives, plants normally decline rapidly and must be replaced by other vines.

Morning glories are our most satisfactory climbing annual. They are practically pest-free except for occasional tortoise beetles that chew holes in the leaves. Portulaca is also practically pest-free, and is one of the best low-growing annuals for sunny locations. Seeds often self-sow, although eventually these volunteers revert to single, less attractive flower forms.

Snapdragons have very small seeds and are best started indoors or purchased as started plants. Their best growth and flowering occurs in cool weather, while hot weather often suppresses flowering. Other than asters, they are probably subject to more insect and disease pests than the other plants in the top ten. ☙

SHAKE A TOMATO TODAY

One of the most intriguing research findings of the year was reported at the 1980 annual meeting of the American Society of Horticultural Science by S. W. Akers and C. A. Mitchell (Department of Horticulture, Purdue University). They provided a highly-controlled environment for tomato seedlings, then gave them periodic vibration treatments (3,000 vibrations/min, 30 min/hr). Result: the plants grew better than their stationary counterparts. ☙

GROWING WINTER BLOOMS FROM SEED

Elizabeth Corning

Adapted from AMERICAN HORTICULTURIST, June/July 1980

Seeds are the age-old infallible mechanism which plants have evolved to assure their eternity. Growing your own plants from seed presents many obvious advantages, as well as many challenges. From an economical point of view a seed packet is still undoubtedly one of the world's greatest bargains, for it would require a much larger expenditure to buy the number of plants able to emerge from one small envelope. For the gardener who enjoys growing plants from seed, there is also the sense of awe and excitement he feels at contemplating the miracle of birth and life wrapped up in these tiny specks of organic matter. And, unless the seeds are hybrids, the outcome of seed germination, due to the variation seed propagation allows among the progeny, provides its own form of excitement.

But sowing seed is only one step in the germination process. Before beginning to grow plants from seed indoors, one must be careful to provide the right growing conditions and to have the right equipment for the project on hand.

A sunny, cool windowsill or enclosed porch is ideal for that crucial moment when the seedlings outgrow their nursery and must be given a new environment for continued growth.

Equipment and Technique

Equipment necessary for successful seed sowing can be very simple. Have available a sterile, quick-draining growing medium, small containers such as plastic flats used by retail outlets for bedding plants, and clean plastic for covering the flats of sown seed.

There are as many opinions as there are gardeners about which is the best sowing medium. I prefer the readily available sterile mixes which can be bought in small quantities at any commercial garden supply store, but I like to add one cup of sharp sand to every bushel of mix. These soilless mixtures must be thoroughly wet before sowing seed in them. One simple watering method is to make a small split in the top of the bag of growing medium and pour in at least eight cups of water per bushel. Hot water will mix easily and effectively. Knead the bag thoroughly until every particle is moistened. Some gardeners prefer to mix their own seeding mediums. The usually recommended formula consists of equal parts of loam, peat and sand.

To prepare the flats, place a layer of paper towels in the bottom of the small plastic flat, then a layer of pebbles or small stones for drainage, then fill to overflowing with the mix. Tamp down firmly using another flat of similar size, fill up again and tamp until the mixture is one-quarter inch from the top. A lower surface for the seed bed inhibits air circulation and produces conditions conducive to rot or fungus diseases, especially the dread damping off.

Many growers advocate adding a thin layer of moist, screened sphagnum moss to the top of the mix. This sterile product has been found helpful in the prevention of disease.

Sow the seeds thinly and as evenly as possible. Think thin at this step, for the emerging seedlings should never crowd each other. The depth to sow seed varies with the size of the seed, but never sow deeper than the seed's own diameter. Many seeds are so fine and dustlike that you should not cover them at all, but merely sprinkle them on the surface and press them down with your fingertips. At this point label each row with variety name and the date of planting.

Next place the flats into a pan containing several inches of water. Let them

Photos: George Taloumis

Cineraria with forced tulips and pussywillow are a pleasant contrast to the winter and a harbinger of spring.

soak until the first moisture appears on the surface. The importance of a firmly packed medium becomes apparent here. It assures capillary action which will bring water up to the top level. Remove the flats at once, drain, cover them with a plastic bag (over the top only, not underneath, and suspended over the soil in such a way that the plastic doesn't rest on the medium), and put them in the spot chosen for the germination process to take place.

Applying bottom heat to the sown seed flats is such a help at this time that it might be considered essential. Thermostatically controlled, cable-heated mats are easy to find and are inexpensive. By placing the flats on one of these mats you can hasten germination. Soaking large seeds overnight before sowing also speeds the germination process.

When seeds are at this stage of development, the flats do not need sun; in fact, the emerging seedlings will prefer a low-light situation. Examine them daily; seeds vary enormously in the time required for germination. Some sprout in as little as a week, while others can take weeks or months. Certain of the hardy primulas, for instance, can remain in a seed flat well over a year before breaking their seed dormancy, so never be hasty in discarding a flat which may appear to have failed.

Forget-me-nots can be grown and will bloom indoors, then moved out to a moist spot in the garden in the spring, where they will come up year after year.

After germination the flats should be gradually moved into full light. If a windowsill is the only available spot, put them as close to the glass as possible. Place a sheet of aluminum foil on the room side to help reflect the light and allow the seedlings to achieve even growth. In order to produce sturdy plants, turn the containers frequently. Otherwise they will have a definite lean toward the light source.

Fluorescent lights are of great benefit, especially at this stage, and it is a good idea to use them if you can. Put the emerging seedlings directly under fluorescent lamps with the soil surface four inches from the light, moving the plants farther away with time to accommodate their increasing height.

Transplanting

When the second set, or "true," leaves appear, it is time to transplant the seedlings. Have ready other flats, firmly filled with either the same soil mixture or with equal parts of loam, sand and peat moss, plus a small amount of organic fertilizer. With a small tool, such as a slotted wooden label, gently lift the tiny plants with as little disturbance to the roots as possible. With pencil or finger, make a small hole in the soil in the new flat, and gently but firmly set in the seedlings, being sure the roots are in contact with the soil. Place the little plants in rows and allow approximately two inches between plants and between rows. Water-in gently, place the flats in a cool, shady spot for a day or two to help the plants recover from the shock of being transplanted, and then return them to their original light and sunny situation.

As soon as the leaves begin to touch, the time has come for the next potting. Shift each small plant into an individual pot, well crocked in the bottom to provide drainage. This potting-on process should be repeated as the plants continue to grow and roots show through the drainage hole. It is extremely important not to let the plants become pot-bound at this stage when they are growing so vigorously. Depending on the ultimate size of each species, they can go from a three-inch to a four-inch and sometimes even to a six-inch pot.

At this stage, light, air, regular watering and fertilizing in strict accordance with the manufacturer's directions should culminate in the ultimate flowering toward which all your efforts have been directed.

Now that you know how to grow most plants from seed, it's time to indulge in the fun of deciding what to grow. The light conditions you can provide for growing, and the amount of space available are the only limiting factors. Always keep in mind that most, if not all, of your seeds will germinate. What fills one small flat at germination may need dozens of large pots in six months.

Plants for Winter Bloom

Herewith are listed some of the species which have proved both attractive and satisfactory for indoor winter bloom. It is best to start with annuals, as they are quick and nearly foolproof. One word of caution: all of these plants need every bit of light you can possibly give them; without it they will be spindly, sickly specimens.

Alyssum is not only first alphabetically, but it is also an excellent choice for quick

Primulas come in a wide variety of colors and forms. Select ones to match or contrast with the indoors. Here are primulas with forced bulbs of paperwhite narcissus.

bloom and delicious fragrance. Lobelia is a delight and in a hanging pot will soon become a total ball of brilliant blue. Browallia, taller and slower, is a must because of its gorgeous blue color. Several plants in a hanging basket are an unforgetable sight. Forget-me-nots are another good blue.

Best sown in early summer for bloom the following winter are: cineraria, mounds of daisy-like blooms in dazzling colors ranging through blues, pinks and red, and dependable and cheerful bloomers in the dullest winter months; slipper flower *(Calceolaria)*, with quaint, pouch-shaped flowers in yellow and orange tones; butterfly flower *(Schizanthus)*, also well named the poor man's orchid and covered with clouds of dainty little blooms in white and pinkish shades: Cretan bears's-tail (*Celsia arcturus*), which produces attractive yellow mullein-like spikes; and the florists' begonia (*Begonia semperflorens*) an old reliable which blooms quickly and always adds a bright spot of color to any room.

Geraniums are great grown from seed, too. They germinate easily and almost immediately produce tiny leaves which are unmistakably true to the species. There are many new developments among geranium species which can be depended upon for obtaining a speedy display.

Nasturtium 'Double Gleam' has blooms in the yellow-orange-red group. Soaking seeds before planting hastens germination.

Some of our best winter bloomers may be treated as perennials. The newest sensations are the Cape-primrose (*Streptocarpus*) hybrids which are appearing in bewildering numbers. Selection work with them continues. Easy and quick from seed, there are many exciting color variations and different growth habits from which to choose. Many other species of the fabulous gesneriads can easily be grown from seed and are a winter delight under the right conditions of light, warmth and humidity.

Without question, the most satisfactory plants for indoor winter bloom are the many varieties of primroses. *Primula kewensis*, with continuous umbels of yellow bloom, will rebloom in successive years as the crowns can be divided and repotted each summer, *P. obconica* will bloom in seven or eight months from seed and will continue all winter, as long as it has cool conditions. This beauty from China comes in a wide range of colors: white, pink, reds and blue. Another Chinese gem is *P. malacoides* in newly improved forms which send up spike after spike filled with dainty little blooms. Here again, this plant will bloom continuously throughout the winter months under cool conditions. *P. polyanthus*, the rugged garden perennial, can be sown in spring, subjected to cold conditions in an outdoor frame and then brought indoors for early forcing of its endearing blooms.

Other Plants

Pansies delight in a cool situation, are easy to grow from seed and are a colorful addition to the window garden. The cheery faces of nasturtiums and their pungent odor also add a bright note on the windowsill. They can be trained to climb upward or will adapt well to a hanging basket. Their large, vigorous seeds almost always germinate.

The florist cyclamens may be grown from seed, but they require a long period to bloom, often a year and a half. Most satisfactory are the miniature varieties. They will bloom in half the time and remain in bloom for an even longer period. They also are more tolerant of home conditions. Their dainty pink, red or white blossoms, poised like butterflies, are a continued delight, and the handsome marbled foliage is an added bonus.

Some seed sources: George W. Park Seed Company, Inc., Greenwood, SC 29647; Thompson & Morgan, P.O. Box 100, Farmingdale, NJ 07727; Kartuz Greenhouses, 1408 Sunset Drive, Vista, CA 92083 for gesneriads. ☘

Helpful advice about . . .

BUYING HOUSE PLANTS BY MAIL

Reprinted from RODALE'S ENCYCLOPEDIA OF INDOOR GARDENING,
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Nearly every newspaper, gardening magazine and seed catalog has them—advertisements offering live house plants by mail, usually at bargain prices. Sometimes they're obviously too good to be true: sometimes they're bona fide opportunities to expand your plant collection cheaply. Telling the difference, and knowing what to do if your expectations aren't met, can save you frustration, time and money. We asked some experts for advice:

"The first thing you should do," cautions Dr. Gilbert F. Daniels, president of the American Horticultural Society, "is know what the plant you're ordering really is. Advertisements or catalogs should list the scientific name and the common name; don't waste money on plants that aren't listed by name. And watch those Sunday supplement advertisements—not all of them are fraudulent, but some are; stay away from the so-called 'wonder plants'."

"If it seems too good to be true, then it probably isn't true," echoes Jane Foster, president of the Mailorder Association of Nurserymen (MAN), a trade association organized to protect the many legitimate plant shippers from the bad publicity earned by a few fly-by-night opportunists.

Obviously, shopping by mail can be a delight. Few greenhouses can afford to stock rarer species of house plants, and those that do often charge premium prices for them. If you have a taste for the exotic, mail ordering can be the best way to augment your indoor garden with unusual plants. But unfamiliarity can be a problem, too. An advertisement for "the horticultural breakthrough of the decade," with vivid hyperbole about a miracle plant's beauty, growth, flower or fruit production, or ability to survive under adverse conditions, may omit the fact that it performs those feats only in a greenhouse, or after being subjected to special treatment, or after a long period of dormancy. Unusual plants often have unusual needs. Reputable advertisers will tell you about those needs; rip-off artists won't. And miracles happen only in the movies, not in the greenhouse.

"If there were miracle plants, we'd surely have them in our catalog," says Klaus Neubner, senior vice-president in charge of horticultural activities for the George W. Park Seed Co., Inc., a major shipper of live house plants that does not deal in miracles.

Folks who get burned usually spend more time looking at the colorful pictures than reading the fine print—an unwise practice, according to Dr. Daniels.

"Believe it or not, some people still order what they think are mature plants because of a picture in an ad, and then are disappointed to find that they've bought tiny seedlings." Dr. Daniels' advice is to read everything in the ad, especially the warranty. Most reputable plant shippers offer full replacement or refund warranties, and the ad should state that.

Foster advises prospective purchasers to look for the MAN seal, which shows that the advertiser subscribes to that organization's code of ethics. If you're buying from a new or unfamiliar source, place a small "test" order first, and keep a copy of your order and check. How well a shipper handles a small order is a good indication of his integrity.

Shipping

Not getting what you thought you ordered is one problem, but getting what you ordered *in poor shape* is quite another. *Low* temperatures *en route* are probably responsible for most mail order house plant problems, with high temperatures and soil displacement running close seconds. Companies like Park are continually refining and retesting their packaging for protection against temperature extremes and shock. (Neubner says that his company tumbles packaged plants in a clothes dryer—on low heat—to test their packaging!) Even so, the most well acclimated and well packaged plant can't survive much more than a ten-day journey in any weather. And, of course, the shipping service has a lot to do with that.

"Once a plant leaves our warehouse, we have no control over it," Neubner explains. "Accidents can happen, delays can occur. Ideally, a plant should be kept between 40° and 60°F (4° and 16°C) while *en route*, but we ship all year round and get an amazing number of plants through without freezing—more than 95 percent. Of course, it's not so good to let a plant sit in the mailbox for a couple of hours when the temperature's below freezing!"

High temperatures cause a buildup of ethylene gas within the carton, which causes leaves to yellow and fall. Heat can dry up the soil, too, and the combination can prove fatal to even the most carefully packaged plant. If you're ordering during the coldest or hottest months and have a choice of shippers, it's good practice to pick the fastest one, even if it means paying a little extra. And arrange to meet your plants so that they don't freeze or bake in your mailbox.

Travel Shock

Some plants are easier to ship than others. Neubner says that Park has given up on shipping cape primrose (*Streptocarpus saxorum*) and removed it from their catalog; ferns tend to develop bruised tips, which are not serious impediments to subsequent growth, he adds; and baby's tears (*Soleirolia soleirolii*) tends to dry out rapidly *en route*, and should not be shipped long distances. Other than those, most plants can be shipped, whatever their size and sensitivities; it's a matter of preparation and packaging. Still, plants don't especially like to travel.

"Any plant that comes into the home will have suffered some trauma," says Dr. Daniels. "But if it's been mishandled or frozen, you'll know it right away—there are no delayed reactions." Emergency first aid may help save the traumatized plant.

"If the plant has been dried out, water it *lightly* and put it in well-filtered light for a few days," Neubner advises, adding that one criterion for a well-packaged plant is that it has been sent with enough soil to prevent drying out.

"If the soil has shaken loose—and that can happen no matter how carefully the plant was packaged—replace the soil and put the plant inside a 'tent' of plastic with a few air holes punched in it, to increase humidity. Make sure the plastic doesn't touch the leaves, though. Any yellow leaves will be lost, but often a marginal plant can be saved this way."

Recourse

If it cannot, the disappointed purchaser should seek a refund or replacement rather than simply writing it off as a loss. If the package has been damaged, notify the carrier right away; both the postal service and private carriers have procedures for handling complaints. If the plant is dead or dying, or if it is not delivered as advertised, you should notify the company immediately by letter, describing the problem as accurately as possible, and asking specifically for a refund or replacement. MAN President Foster recommends sending a copy to her, c/o Jackson and Perkins, Medford, OR 97501.

If you get no reply, or an unsatisfactory reply, within thirty days, send a second letter to the shipper and enclose a copy of your first letter. In addition, send copies of the letter and the canceled check, making sure you include the name and address of the company involved to MAN; the Federal Trade Commission (Washington, DC 20260, Attn: Consumer Protection Division); the Consumer Protection Division of the Attorney General's Office in the shipper's home state; the United States Postal Service (Washington, DC 20260, Attn: Thomas Chadwick); and the Mail Order Action Line service of the Direct Mail Marketing Association (6 E. 43rd St., New York, NY 10017). It helps to send the second letter by registered mail.

Garden Writers Association of America past President Corinne Willard addressed the problem at the 30th Anniversary Annual Meeting in late 1978. Her advice was to "write to the publication in which you read the ad. Complain to them. If more readers would do that, deceptive horticultural advertising could be eliminated because reliable publications would not accept (it)."

RECENT BOOKS WORTH NOTING

IN THE LIBRARY OF THE BROOKLYN BOTANIC GARDEN

(Please order directly from your bookstore, not from the Botanic Garden)

ENCYCLOPEDIA

The New York Botanical Garden Encyclopedia of Horticulture by Thomas H. Everett. Garland Publishing, Inc., New York. Vol. I, A-Be, $52.50. Nine additional volumes to be issued shortly. Total, $525

The author, who served for many years as senior horticulturist at NYBG, has spent the last twelve compiling this monumental work, which covers 3,600 genera and has 10,000 photographs. Unfortunately, the price rules it out for most home gardeners, but the set should become a very useful reference in horticultural libraries.

FLOWERS

The New York Times Book of Annuals and Perennials by Joan Lee Faust. Times Books, New York. $12.50

Brief, sensible introduction to the better-known kinds, their uses and care. The author is garden editor of *The New York Times*.

The Book of Tulips by Tom Lodewijk. Vendome Press, Viking Press, New York. $14.95

These bulbs are almost synonymous with spring, and their history, especially during the period of tulipomania, is fascinating. An attractive volume with the Dutch bulb industry very much in center stage. Tulip care.

FOR YOUNG PEOPLE

My Garden by Louise Murphy, with illustrations by Lisa C. Ernst. Charles Scribner's Sons, New York. $8.95

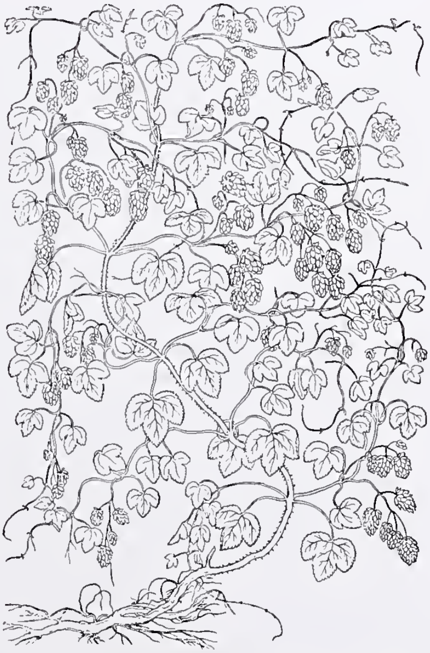
Pleasant reading for 6-12-year-olds, to teach some aspects of gardening. In journal form.

Traps and Lures in the Living World by Joan E. Rahn. Atheneum, New York. $8.95

Did you know that Carolina allspice (*Calycanthus*) and birthwort (*Aristolochia*) have floral devices ("tender traps") to catch pollinators or that there are predacious fungi? Though issued as a children's book, presumably because carnivorous plants are included—and they appeal to children—this is an equally absorbing account for adults. There is also a section on fish and spiders.

HERBS, CRAFTS, CULINARY

The Illustrated Herbal by Wilfred Blunt and Sandra Raphael. Thames and Hud-



Hops *(Humulus lupulus)* from *De Historia Stirpium* by Leonhard Fuchs, Basel, 1542.

son, distributed by W.W. Norton & Co., Scranton, Pennsylvania. $24.95

Some sixty-four very striking color plates from old herbals are presented here with succinct, scholarly text by two English bibliophiles.

Park's Success with Herbs by Gertrude B. Foster and Rosemary F. Louden. Geo. W. Park Seed Co., Greenwood, South Carolina. $9.95

About 150 kinds are described by the author and her daughter, with cultural notes, lore and recipes. Illustrated in color. Mrs. Foster is editor of "The Herb Grower," a quarterly published in Falls Village, Connecticut, and has written extensively and knowledgeably on herbs over the years. There are herb charts as well as a chapter on garden design.

A Country Herbal by Lesley Gordon. Mayflower Books, New York. $19.95

Fact and lore from England on more than 130 kinds of herbs, in alphabetical order. Recipes and attractive color plates.

Gather Ye Wild Things by Susan Tyler Hitchcock. Harper & Row, New York. $10.95

Collecting wild plants to eat has had quite a revival since Euell Gibbons' *Stalking the Wild Asparagus*. Here is another set of personalized essays on appropriate plants. The drawings by G.B. McIntosh are of high quality.

Nature Crafts by Mary Elizabeth Johnson and Katherine Pearson. Oxmoor House, Birmingham, Alabama. $17.95

How to make willow baskets, cornhusk flowers, rosemary and yarrow wreaths, natural dyes for Easter eggs, and many other things. The numerous drawings and photographs are a help.

The Encyclopedia of Herbs and Herbalism edited by Malcolm Stuart. Grosset & Dunlap, New York. $35

Another in what seems an endless number of big, visually pleasing herb books from England, this one has chapters by different authors on the biology and chemistry of plants, medicinal plants, domestic uses and cultivation. Much of the book is given to an "encyclopedia" approach to plants, with a historical emphasis.

HISTORY, ARCHITECTURE

The French Garden 1500-1800 by William Howard Adams. George Braziller, New York. $19.95

It was more than Le Nôtre and Versailles, but the formal design influenced architects in many countries for years. The author is with the National Gallery of Art in Washington, D.C.

The Complete Book of 169 Redouté Roses by Frank J. Anderson. Abbeville Press, New York. $17.95

Each full-page reproduction of roses by the old French Master is fit for cutting and framing. 'Tis a pity because the author's erudite and witty comments about these roses don't deserve the scissors. There are two other excellent volumes in the series, *Cultivated Flowers* and *Orchids*. Same price, with commentary by the inimitable Mr. Anderson.

The Fossil Hunters by Henry N. Andrews. Cornell University Press, Ithaca, New York. $28.50

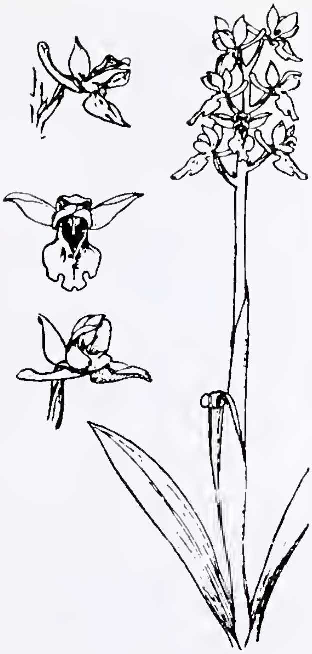
Scholarly account of the little-known men who shaped the somewhat esoteric field of paleobotany. Of interest to the student as well as to the person captivated by the history of science.

The Life and Adventures of John Muir by James Mitchell Clarke. Sierra Club Books, San Francisco. Softcover $7.50

The adventures of one of America's early conservationists—and founder of the Sierra Club. Good bedside reading for naturalists.

Science and Colonial Expansion: The Role of the British Royal Botanic Gardens by Lucile H. Brockway. Academic Press, New York. $21

Gardeners today think of Kew in terms of broad walks and herbaceous borders, an unrivalled plant collection, big greenhouses and tired feet (it has three hundred acres). There is the less-recognized role the institution had in economic botany—the growth of the British Empire. Here is the story of cinchona, rubber, sisal and other plants, and their transfer under the auspices of



Early purple orchid *(Orchis mascula)* drawn by Richard G. Hatton in the style of the old herbals.

Kew from one part of the world to another.

Irish Gardens and Demesnes from 1830 by Edward Malins and Patrick Bowe. Rizzoli International Publications, New York. $35
Irish gardens have been much in the shadow of their English counterparts, but there were—and are—a number of fine ones. This is a handsome volume with the emphasis on the history of landscape architecture and how various movements in other countries affected the Emerald Isle. Curiously, there has even been a Japanese influence.

The History of Gardens by Christopher Thacker. University of California Press, Berkeley. $35
A scholarly British overview of particular interest to the landscape architecture community, but with fascinating chapters on early Persian, Chinese and Japanese gardens, as well as on later sorts, with due credit to Le Nôtre, Capability Brown, William Robinson and Gertrude Jekyll.

INDOOR PLANTS

Dr. Greenfinger's ℞ for Healthy, Vigorous Houseplants by Andrew Bicknell. Crown Publishers, New York. $12.95
Preventive medicine makes good sense for human beings—and plants, too. An English writer gives cultural recommendations for a number of popular indoor plants, also brief descriptions of the plants.

The Healthy House Plant by Jean F. Blashfield. Little, Brown and Company, Boston. $12.95
Less than 1 percent of insects are harmful, but they all seem to be on the gardenia. This chatty but helpful look pinpoints some of the major plant-pest problems for new growers and suggests cures.

Cacti and Succulents for the Amateur by Charles Glass and Robert Foster. Blandford Press, distributed by Sterling Publishing Co., New York. Softcover $4.95
A concise, well-illustrated introduction to desert plants by the editors of the *Cactus and Succulent Journal*. The authors are American, the book British.

Rodale's Encyclopedia of Indoor Gardening, edited by Anne M. Halpin. Rodale Press, Emmaus, Pennsylvania. $24.95
The term encyclopedia is used loosely in gardening circles, but this book is a much more thorough treatment than other current ones on indoor plants. There are chapters on the principal groups of house plants, a section on tools and techniques, and another on special environments. The "organic" gospel is surprisingly unobtrusive. Recommended.

Miniature Orchids by Rebecca Tysen Northen. Van Nostrand Reinhold, New York. $26.95
Because not many people have the space they used to, there has been increased interest in smaller plants for the

greenhouse, home and garden. Mrs. Northen, a respected veteran grower, brings us up-to-date on appropriate dendrobiums, masdevallias and many others, with descriptions and cultural notes.

Beautiful Leaved Plants by Frances Perry. David R. Godine, Publisher, Boston. $17.95

Attractive color plates by Victorian-Era printer Benjamin Fawcett are presented with notes by a well-known English garden writer. Most of the plants are subtropicals, many have variegated leaves, all are period pieces. Intended mainly for indoor growers, though few of the plants are really adapted for modern homes.

MISCELLANEOUS

Jungles, edited by Edward S. Ayensu. Crown Publishers, New York. $35

They are disappearing in pieces the size of Delaware, and it is time we learn something about them. This is a big, attractive, very well illustrated volume edited by an African-born botanist who is with the Smithsonian Institution.

The World of the Tent-Makers by V.G. Dethier. University of Massachusetts Press, Amherst. Softcover $5.95, hardcover $12.50

Plant pests don't usually make for good reading, but this absorbing account of the life of the eastern tent caterpillar is first-rate, almost poetic. One of the year's best.

Mushrooms: A Separate Kingdom by David T. Jenkins, with illustrations by Loni Parker. Oxmoor House, Birmingham, Alabama. $16.95

A pretty enough volume, but the better-than-average color drawings overshadow an interesting text which is obscured by the irritating use of an old-timey German script.

PERSONAL EXPERIENCES

The Englishwoman's Garden, edited by Alvilde Lees-Milne and Rosemary Verey. Chatto & Windus Ltd., London. $24.95

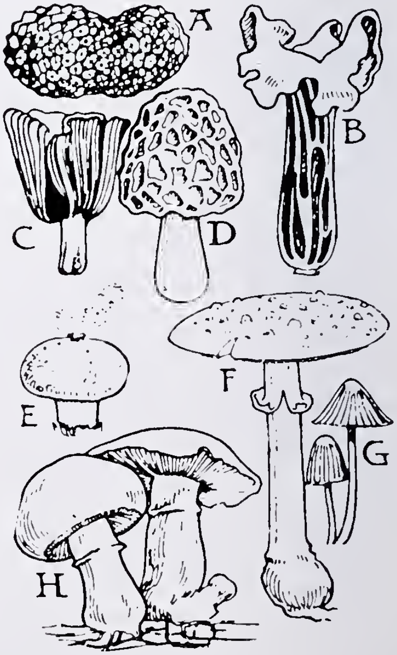
Some thirty-six British women of varying horticultural experience write brief chapters about their gardens. The conception of the book may be questioned by some men—and women—but it is pleasant reading, and some of the contributions, *e.g.*, those of nursery-owner Beth Chatto and writer Mea Allan, are of special interest.

Janet Marsh's Nature Diary by Janet Marsh. William Morrow and Co., New York. $24.95

In mood and attractiveness this is a follow-up to the best-selling *Country Diary of an Edwardian Lady*. The quality of the art work exceeds that of the text.

SCIENTIFIC

A Dictionary of Botany by R. John Little



Various fungi, chiefly from *The Vegetable Kingdom*, John Lindley, London, 1845.

Fuller's teasel (*Dipsacus fullonum*) from *De Historia Stirpium* by Leonhard Fuchs, Basel, 1542.

and C. Eugene Jones. Van Nostrand Reinhold, New York. $18.50
Ever wonder what polygamo-dioecious means? This and some 5,500 other terms are explained succinctly.

Toxic Plants, edited by A. Douglas Kinghorn. Columbia University Press, New York. $20
Nine contributors shed light on the poisonous properties of several plant families. There are sections on toxic mushrooms and household ornamentals. The subject in the past has lent itself to distortion, even hysteria, and John Kingsbury, in a fine introductory chapter, does his best to restore perspective.

Flower and Vegetable Plant Breeding by Leslie Watts. Grower Books, London, distributed by ISBS, Portland, Oregon. $22.50
Although intended for the professional, the discussion on basic genetics and breeding techniques may be of interest to the keen amateur, perhaps after reading the BBG Handbook, *Breeding Plants for Home and Garden*.

TECHNIQUES, GARDENING

America's Garden Book by James and Louise Bush-Brown. Charles Scribner's Sons, New York. $22.50
Revision by New York Botanical Garden staff members of a popular one-volume "encyclopedia." A section on indoor plants in included.

Hydroponics for the Home Gardener by Stewart Kenyon. Van Nostrand Reinhold, New York. $6.95
Hydroponics probably has a bright future in the raising of lettuce and other cool-greenhouse winter crops in the North, since it gets more expensive each year to ship lettuce from California to the outreaches. The idea can also be adapted as a hobby in the home by the gardener with a slight chemistry bent. Some step-by-step methods are given here.

Drip System Watering by Jack Kramer. W.W. Norton and Co., New York. $9.95
An underground trickle-hose system to conserve water, yet grow plants well, has been in use on crops in drier areas for some years. The author suggests ways to put the idea to work in the home garden.

TREES, SHRUBS AND VINES

Conifers by David Carr. Batsford, North Pomfret, Vermont. $22
From England, descriptions of fifty species and their cultivars, with tables depicting traits of each species. The tables and drawings showing growth rates must be used with caution because of climate differences.

The Larger Species of Rhododendrons by Peter Cox. Batsford, North Pomfret, Vermont. $47.95
Of interest mainly to the advanced grower

or specialist, with emphasis on current rhododendron classification. Most of the book consists of descriptions of major species and their performance in Britain. The author is a Scottish nurseryman.

The Complete Trees of North America by Thomas S. Elias. Van Nostrand Reinhold, New York. $19.95

Good thumbnail descriptions of eight hundred trees, with line drawings of foliage, flowers and fruits. Range maps and keys. Too hefty for the field but useful in the home library to check identifications. Trees from milder regions are included as well.

Trees for Every Purpose by Joseph Hudak. McGraw-Hill, New York. $21.95

A Massachusetts landscape architect concisely describes 257 trees, with line drawings by Artemas Richardson. Some mild-climate species are included; also brief sections on tree care and design guidelines. The reader is left wishing for more information on the architectural uses of trees and on pests and diseases.

Audubon Society Field Guide to North American Trees by Elbert L. Little. Alfred A. Knopf, New York. Separate volumes for Eastern and Western regions. $9.95 each

These are bulky guides if indeed you do take them to the field, but they are unusually well illustrated with many fine color photographs, assembled for Knopf by Chanticleer Press. The text is routine.

The Pine Tree Book by Russell Peterson. Brandywine Press, New York. $14.95

Brief descriptive text of major species. The color drawings by Patricia Wynne are of superior quality.

Ivies by Peter Q. Rose. Blandford Press, distributed in U.S. by Sterling Publishing Co., New York. $17.50

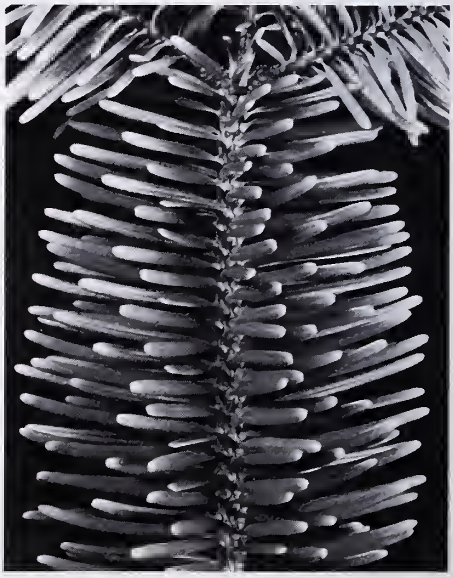
The place of ivies in history is firmly established, but English ivy itself is perhaps the most variable of all woody plants, and the numerous cultivars are an endless source of confusion. The author, a plant inspector in England, unravels much of the mystery. A well-documented account, and the color photographs are a fine aid to identification.

Trees and Shrubs for Northern Gardens by Leon C. Snyder. University of Minnesota Press, Minneapolis. $17.95

The coldest reaches of the United States are often ignored in garden books, so Professor Snyder's book should help in the selection of woody plants for people living there. Essentially an alphabetical guide to four hundred kinds of trees and shrubs. There is a key to genera. The author is former director of the University of Minnesota Landscape Arboretum.

Manual of Dwarf Conifers by Humphrey J. Welch. Theophrastus Publishers, Garland Publishing, Inc., New York. $25

The subject is one of much confusion, for conifers are infinitely variable and the naming of slow-growing cultivars has been indiscriminate. Mr. Welch, an English nurseryman, attempts to straighten the muddle and does better than most. The book should be a definite help to gardeners with large collections of "dwarf" plants. ❧



William M. Harlow

Nikko fir *(Abies homolepis)*. The needles are arranged spirally around the stem.

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Hal Morgan

A photographic study in autumn light of the Conservatory at the Brooklyn Botanic Garden. Note the animal-head decoration, upper center.

AN INVITATION TO JOIN AND ENJOY

A man does not plant a tree for himself;
he plants it for posterity.
—Alexander Smith

ALL who read these lines and are interested in the out-of-doors and the beauty of living things are cordially invited to become Members of the Brooklyn Botanic Garden. The dues are $15 annually. Memberships make fine gifts, too. For many, the Botanic Garden means spiritual enrichment, and they find satisfaction in contributing toward its support. Others enjoy the Membership opportunities, which include a subscription to PLANTS & GARDENS, occasional plant and seed "dividends," popular short courses at reduced rates and other benefits. Why not get pleasure from both?

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2. Date of Filing: September 18, 1980
3. Frequency of issue: Quarterly.
4. Location of known office of publication: 1000 Washington Avenue, Kings County, Brooklyn, New York 11225.
5. Location of headquarters or general business offices of the publishers: 1000 Washington Avenue, Brooklyn, New York 11225.
6. Names and addresses of publisher, editor, and managing editor:

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